

# THE STOCK MARKET PLUNGE: WHAT HAPPENED AND WHAT IS NEXT?

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## HEARING BEFORE THE SUBCOMMITTEE ON CAPITAL MARKETS, INSURANCE, AND GOVERNMENT SPONSORED ENTERPRISES OF THE COMMITTEE ON FINANCIAL SERVICES U.S. HOUSE OF REPRESENTATIVES ONE HUNDRED ELEVENTH CONGRESS SECOND SESSION

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## **THE STOCK MARKET PLUNGE: WHAT HAPPENED AND WHAT IS NEXT?**

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**Tuesday, May 11, 2010**

U.S. HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON CAPITAL MARKETS,  
INSURANCE, AND GOVERNMENT  
SPONSORED ENTERPRISES,  
COMMITTEE ON FINANCIAL SERVICES,  
*Washington, D.C.*

The subcommittee met, pursuant to notice, at 3 p.m., in room 2128, Rayburn House Office Building, Hon. Paul E. Kanjorski [chairman of the subcommittee] presiding.

Members present: Representatives Kanjorski, Ackerman, Sherman, Capuano, Hinojosa, Miller of North Carolina, Scott, Bean, Klein, Perlmutter, Donnelly, Carson, Foster, Adler, Kosmas; Garrett, Lucas, Manzullo, Royce, Biggert, Capito, Hensarling, Campbell, and Neugebauer.

Ex officio present: Representatives Frank and Bachus.

Also present: Representative Moore of Kansas.

Chairman KANJORSKI. This hearing of the Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises will come to order. Pursuant to committee rules, each side will have 15 minutes for opening statements.

Without objection, all members' openings statements will be made a part of the record.

I ask unanimous consent that Congressman Moore be allowed to participate in today's subcommittee hearing. Without objection, it is so ordered.

Good afternoon. At today's hearing, we will examine the frightening afternoon of May 6th, one of the most volatile trading days in history. Within minutes, stock market indices dropped precipitously, erasing more than \$1 trillion in capitalization before recovering. While we may not yet have all of the facts about these events, we must quickly analyze what happened and embrace reforms in order to restore market integrity and promote investor confidence.

Going back to 2003, questions surrounding market structure have received considerable attention in this subcommittee. Many of the issues we have previously explored remain just as relevant today, especially the longstanding debates of man versus machine and price versus speed.

These prior hearings have also taught me that our regulators must remain nimble by continuing to adapt market structure rules to respond to an ever-evolving environment. Technological ad-

vances have dramatically altered the way Wall Street operates. Such progress is natural. For the United States to continue to lead the world's capital markets, we must continue to encourage innovation.

But change also can have its downside. Many have cited the role of computers in contributing to and exacerbating last week's gyrations. In recent years, high-frequency trading has exploded. Barely a blip 2 decades ago when technology constraints and growth last crushed the markets, automated traders today move in miniseconds and make up as much as two-thirds of daily trading volume. Their decisions to trade or not to trade can produce real consequences.

We too have moved from a model of two major trading centers to an electronic network with dozens of marketplaces for trading equities, creating new headaches for regulators. The ascendancy of computerized trading and automated exchanges in our capital markets appears to have created a plot as intriguing as "2001: A Space Odyssey." Today, however, it is 2010, and we must figure how to effectively balance artificial intelligence with human judgment.

This hearing will help us to achieve that goal. It can also help us to determine how to harness technology to create effective audit trails for regulators.

Somewhere along the way, competition among exchanges, alternative trading systems and others has additionally led to increased fragmentation. As old trading methods have given way to modern techniques, the rules governing our market architecture have lagged behind. We now must better integrate our markets.

In this regard, I encourage that regulators and exchanges are already working together to adapt new rules for creating uniform single-stock circuit breakers and updating archaic marketwide trading halts. Most importantly, we must protect investors' interests. They deserve fair and orderly markets, which the Securities and Exchange Commission exists to ensure.

Despite this mandate, the markets were hardly fair or orderly during last Thursday's roller coaster ride. In this turmoil, some investors lost mightily. One recent news story highlights a couple who lost \$100,000 because their trade cleared at the wrong moment during Thursday's chaos. This turbulence additionally triggered costly stop-loss orders for many investors and may have placed others in unintended short positions as trades unwound.

The market mayhem also, unfortunately, revealed the arbitrariness of the process for identifying and canceling clearly erroneous trades. Moreover, the decision to rescind some trades may have ultimately benefited those who aided and abetted the plunge. This is wrong. They placed a bet and deserve to lose.

Although stock values quickly sprang back this time, the experience may prove quite different next time. A ghost-in-the-machine scenario in which an enormous computer selloff sparks a vicious cycle of selling and panic seems completely plausible. To thwart this doomsday hypothetical, regulators must act with great speed and great care to promulgate new rules. The SEC has already begun this process with its January concept release on market structure.



In sum, our witnesses can shed light on the 20 harrowing minutes of last week's flash crash. They can also explain how we should respond to technological advances, increased competition, and other market evolutions in ways that best protect investors.

I thank each of the witnesses for appearing, especially on such short notice, and I am eager to hear their testimony.

I would now like to recognize the ranking member, the gentleman from New Jersey, Mr. Garrett, for 5 minutes.

Mr. GARRETT. I thank the chairman, and I thank the witnesses.

Yes, today's hearing is certainly timely, given the events of the last week. But in retrospect, considering the work that the regulators have already been doing the last few days, it might have been wise to wait just a few more days to hold this hearing, to give our witnesses additional time to gather information more fully and to analyze the events of the last few weeks so ultimately we could come here and be fully informed as to this subcommittee's inquiries.

Broadly speaking as well, in a more ideal situation, I guess you could say that this subcommittee should be conducting oversight of the SEC and our financial markets, I guess you would say in a more proactive way, rather than a reactive way. Until her recent testimony here with regard to the Lehman bankruptcy, Chairman Shapiro had testified just twice since she was sworn in. That is far less frequently than her peers who head other major financial regulatory agencies. Never before today has she been asked to testify on market structure reform, despite the SEC's ambitious agenda in this area.

So it is precisely for this reason that Ranking Member Bachus and I sent a letter to Chairman Frank requesting that this committee hold one or more SEC oversight hearings and to do it soon—4 weeks ago, we asked that.

We stated in the letter, "It is our constitutional duty to perform regular oversight to allow members and the general public to determine the suitability and impact of the SEC proposals as well as judge the quality of the Commission's work in furtherance of its congressionally mandated mission to protect investors, maintain a fair, orderly, and efficient market, and facilitate capital formation."

Clearly, some will say the degree to which the SEC is currently fulfilling all of the aspects of this mission might be said to be called into question during at least the events of this last week, which is why it is important that this subcommittee does examine what went on. That being said, the events of last week will only serve to heighten the already politicized atmosphere surrounding the SEC's examination overall of market structure.

In another letter, in a comment letter on the Commission's equity market structure concept release that I sent to Chairman Schapiro on April 22nd, I wrote, "While I appreciate the Commission's recent efforts to undertake a comprehensive review of our Nation's equity market structure, I want to ensure that this analysis starts from the vantage point of preserving or enhancing that which makes our equity trading markets strong and that change is not pursued purely or largely in response to any external pressures on entities."

I went on to write, "As an independent, nonpartisan agency, the SEC has been entrusted with the responsibility to make its decisions based on objective, prudent, and disciplined analysis, and it is a great responsibility and requires an adherence to a balanced and data-driven empirical approach to ensure that regulatory efforts focus on those most productive areas."

Finally, I expressed concern in a letter that, in the concept release, the Commission's request for comments respecting the interests of long-term and short-term investors seems to focus on a perceived conflict between such groups with really no reference to the critical interdependency between those groups and the overall equity market structure.

So I am hopeful that the tone of such requests are not really reflective of the SEC's analytical framework, and would rather urge the Commission to consider that it should be determined that the additional rulemaking be required and the most successful outcome would be the one that benefits the synergy relationship as a whole.

So at today's hearing I will be as interested as everyone else to hear from both the SEC and the CFTC, as well as representatives from the other exchanges, to better understand their perspective on the events of last week. Clearly, concerns over the financial stability of Greece and other European countries were weighing heavily on investors last week, but it appears that something else may have factored into the sudden drops in the markets as well.

I am hopeful that today's hearing will begin to provide clarity as to what exactly happened, and I am also hopeful that we will begin to have a measured and thoughtful discussion on what, if anything, should be done in a regulatory manner to address what happened then. We should not, however, rush to judgment for the sake of any political cover in any of this. If prudent steps can be taken to improve the performance of our markets, we should always take those and be open to new ideas, while keeping in mind throughout our discussion what potential negative consequences might occur due to any proposed reforms.

Again, I look forward to all the witnesses' testimony. Thank you.

Chairman KANJORSKI. The Chair recognizes the chairman of the full committee, Chairman Frank, for 2 minutes.

The CHAIRMAN. Mr. Chairman, I want to begin by congratulating you for having this hearing. I think the suggestion by the ranking member that we should have waited is clearly wrong. The American people are rightly disturbed. The world is questioning it. This is a very important issue. This need not be the last word. But to have failed to have a public hearing on these issues right away would have been to not have done our duty, and you are to be congratulated for moving so quickly to begin this process.

I also would say I was somewhat struck when the ranking member made two points that seemed to me to be somewhat at odds with each other: One, that we haven't had enough hearings in which members of this committee can criticize the SEC for over-regulating, which is essentially what he was talking about; and two, that we should respect their independence. He has a right, obviously, to be concerned that the SEC is being more activist in its regulatory agenda than the previous Administration had been. I welcome that. I think that what they are doing is very appropriate,

and in fact I think hearings, with the frequency which we have had them, have been a useful way to do that.

I also want to note that one of the issues we need to be addressing—and I will be talking about this later—is there are some innocent victims here. There are individuals who had invested in American stocks, as they have been urged to do, who suffered losses through no fault of their own, and I think we should continue to look at what could be done by way of compensation.

Finally, it is clear that we have the interaction here of some technical issues plus the crisis in Europe. I welcome—and here, again, there was a difference amongst some of us; the House Republican Conference had written to Vice President Biden telling him to stay out of any efforts by the IMF to try to deal with the crisis in Europe. I am glad that advice was disregarded. I think the action in which the American officials participated was very helpful in averting further damage, and we will obviously be looking into that further.

Chairman KANJORSKI. Thank you, Chairman Frank.

The gentleman from Alabama, Mr. Bachus, is recognized for 4 minutes.

Mr. BACHUS. Thank you, Mr. Chairman.

The American financial markets are the most modern in the world. They execute trades more efficiently and economically than ever before. They are the envy of the world, the fastest and most liquid in the world.

However, some of the innovations, high-frequency computer-driven trading across multiple platforms and forums, does create the possibility of the events that we witnessed last week.

All innovations bring problems but also progress. Our challenge is to find a solution that addresses the problems, but does not destroy the benefits. In my opinion since, really, January, the SEC has done this. They have acted in a measured way, and I think the meeting yesterday was most appropriate. As the full Financial Services Committee ranking member, I did say that we probably should wait until at least the trades were completed to meet and let you have an opportunity to respond, and I think you have done so appropriately. But we are here, and whether they we are here today or 2 days from now is, I think, probably irrelevant.

Rational concern, rising risk, and a technically over-bought market that had raced ahead 70 percent in the past year resulted in a skittish market, increased volatility, and an environment subject or vulnerable to panic.

Any number of events could have contributed to the market plunge last Thursday. We have all read the laundry list of what could have happened, what may have happened, or it could have been a combination of things. But I think what is safe to assume is without some preventive measures, they can happen again, because any number of things, as were mentioned, could precipitate such an event.

In fact, prior to last Thursday, on April 27th, you had a smaller event occur, not of the velocity or steepness or quickness, but you have had similar events happen in individual stocks, but none as widespread as last Thursday. However, I think because of the dramatic and suddenness of last week's event, there is something con-

structive in that, and although it undermined investor confidence, I think it clearly pointed out the need for action.

In January of this year, the SEC, to its credit, voted unanimously to move forward with a broad review of equity market structure and issued a concept release seeking public comment on such issues as high-frequency trading, collocating trading terminals, dark liquidity, market quality metrics, and the fairness of the market structure.

Last Thursday's events, I believe, give the SEC the political clout it needs to take action to institute measures to help insulate the markets from what has been described as electronic meltdown, and I think it has brought a consensus among the exchanges. It won't be a total cure, nor will there ever be, but it is a good first move or good preventive measure.

As we move forward, my only advice is to be cautious. Solutions are likely to take careful thought and time, and I commend the exchanges and the SEC for the good start on Monday. It is more important to get it right than it is to get it done quickly and with less precision.

I will close by saying when you see the type of temporary anarchy that we witnessed last Thursday, it is appropriate to take some preventive measures. With our children and grandchildren, we take a timeout, and I think that we are establishing a procedure similar to that with our markets when they do lapse into what we witnessed last Thursday. It restores our children's sanity, and I think these preventive measures you proposed will restore investor confidence and a certain amount of stability to the markets.

So I commend you for what I have witnessed in the last 72 hours. You have done a commendable job.

Chairman KANJORSKI. The gentleman's time has expired.

The gentleman from New York, Mr. Ackerman, is recognized for 2 minutes.

Mr. ACKERMAN. Thank you, Mr. Chairman.

I have been advocating for the reinstatement of the uptick rule for the better part of 3 years, and for the better part of 3 years, critics of the uptick rule have argued that reinstating the price test that had been in place for 70 years would have had little or no practical impact on protecting our exchanges and America's investors from nonsensical, irrational, and arbitrary runs.

Then the Dow lost 1,000 points in a matter of minutes last Thursday, despite the New York Stock Exchange's circuit breaker protections, and apparently as a result of a well-intentioned SEC regulation meant to encourage more faster trading that mandates electronic trades bypassing exchanges that cannot guarantee the investors the best price for a particular stock.

In other words, the SEC's regulation NMS overrode the New York Stock Exchange's protection mechanisms, exacerbated a nonsensical, irrational, and arbitrary run last Thursday, a run that briefly wiped out \$1 trillion, a run that the uptick rule would have prevented.

I hate to say I told you so, so I won't. Instead, I will say what I have been saying for years. I will say that the uptick rule would have prevented the Dow's 1,000 point plunge last Thursday. I will say that investor confidence is of paramount importance to our

markets and the ability of our economy to recover from the deepest recession since the Great Depression. And I will say, instead, that in the wake of last Thursday's events, if our regulators don't reinstitute some type of meaningful, permanent, across-the-board price test similar to the uptick rule very soon, investors will have very little confidence in our markets and in our regulators, and I can't say that I blame them.

I yield back the balance of my time.

Chairman KANJORSKI. Thank you very much, Mr. Ackerman.

We now have the gentleman from California, Mr. Royce, for 3 minutes.

Mr. ROYCE. Thank you, Mr. Chairman. I appreciate the time here.

I am not sure the uptick rule would have done anything to stave this off at all. In terms of the studies I have seen—and I understand the SEC is still going to take the balance of the week to give us the triggering event, and I know that they are sorting through 40 different market participants, market centers here, in order to try to glean that information.

But in the meantime, let me make some observations. One is that I think if you ask the average American investor what is important, he would say an orderly, well-functioning, trading environment. I think she or he would say that there is a little bit of apprehension in terms of what has happened in the past in the market.

I am going to go back to October of 2002 when Bear Stearns sent an order to sell \$4 billion in stocks in the Standard & Poor's 500 stock index. They meant to send an order for \$4 million, not \$4 billion. Fortunately, at the time, the New York Stock Exchange specialists saw that and they sent that information back to the Bear Stearns floor brokers. After all, this was a time when we had specialists handling and slowing down a lot of these problems. But they didn't get it handled before \$622 million in stock had been sold, instead of \$4 million.

So that gives us a window back into what has happened in the past, where I think investors first began to get spooked about what could happen in the market. Back then, of course, we only had two dominant centers: the New York Stock Exchange; and NASDAQ. Now, the SEC is looking at 40 different market centers.

So I think as we go forward, we can look at some of the upsides that we have seen. The bid-ask spreads have been reduced by the fact that everything has sped up in the market. In some ways, the market is more efficient. But we know that Germany and other countries have looked at ways to look at individual stocks and put real-time circuit breakers in effect, where if those stocks drop more than 5 percent, you are going to have a hold; in 5 minutes, you are going to have a hold after that on transactions as regulators and market participants focus on what is afoot, in case we have something like the Bear Stearns errant order back in 2002.

As we move forward, I think we recognize that our markets now react in milliseconds to events, but they are monitored by humans who respond in minutes, and in those minutes, you can have the loss of billions of dollars of damage.

Let me also say that I don't think the members here are criticizing the SEC for overregulating. I think we want the SEC to reg-

ulate. I think my concern has been that market knowledge and experience is greatly lacking at the agency. As myself and my colleagues have said in the past, it is overlawyered at the SEC.

We had the observations during the Bernie Madoff and the Alan Stanford Ponzi scheme cases, where we heard from Mr. Markopolos about the problems at the SEC. And we are hoping that culture can be changed as the SEC looks into this particular problem as well, and reengineering the oversight, and perhaps putting into effect better circuit breakers to handle this problem.

Thank you, Mr. Chairman.

Chairman KANJORSKI. Thank you, Mr. Royce.

Now, we will hear from the gentleman from California, Mr. Sherman, for 2 minutes.

Mr. SHERMAN. Thank you, Mr. Chairman.

I think the issue before us is, what is the social utility of high-frequency trading. Should it be limited? Should it be taxed? Or do we benefit from enormous quantities of money moving in and out of a stock for a few minutes?

We are told that the meltdown will cause no lasting harm. I think this is shortsighted. Investors for many years will be demanding a risk premium for what they perceive as a market that can go crazy, at least for an hour or half an hour, and we will be told that with a few patches, the system will work fine in the future and this could never happen again.

Sure.

In our society, we have allocated some of the smartest business and computer minds to Wall Street. We are told that they should earn the highest rates of return on their intellectual capital of any profession because they allocate capital to our real businesses.

But what does that have to do with high-frequency trading? Is high-frequency trading a necessary part of allocating capital to real businesses, or is it a parasitic attachment in which some smart people with some fast computers can take a little piece of the profit that each real investor should get and divert it to themselves? Are Accenture and Procter & Gamble and 3M better off today as operating businesses because their stocks are subject to high-frequency trading?

I would think that what is likely to happen is we will patch up the present system and tell the American people not to worry. But I hope, instead, that we will take a look at high-frequency trading and see whether it should be limited or subject to just a small tax to recognize that there is a social cost to this activity and it is something that we might want to discourage so that real investors reap the profits on Wall Street.

I yield back.

Chairman KANJORSKI. Thank you very much, Mr. Sherman.

The gentleman from Texas, Mr. Hensarling, for 3 minutes.

Mr. HENSARLING. Thank you, Mr. Chairman.

I certainly agree this is an important hearing. Any time \$1 trillion of market value disappears in a matter of minutes and a lot of small investors are hurt, we need to have a congressional hearing. To the extent that we are going to receive answers today from our panel, then I applaud the timing of the hearing. To the extent

we are hindering the panelists from finding those answers, then I question the timing of the hearing.

Frequently, when we have extreme market volatility, the cry goes out, somewhere quick, "Let's shoot the computers." I have never really agreed with that particular position, although I do have an open mind that perhaps some reprogramming may be in order. Specifically, I do believe that we at least need to look and examine the desirability of having stock-specific circuit breakers across all of our markets, and certainly, there is an open question on the impact of canceling trades. How many folks ended up with unintended short positions while arguably adding needed liquidity in a sinking market?

But at the end of the day, I think we should tread very, very carefully in this space. Improved technology, rule MNS, have brought great benefits to trading: more competitive markets; cheaper trades; and really a democratization of investment opportunities. But more importantly, I believe that we need to look beyond simply the mechanics of the panic and look to its likely underlying cause, that being the international debt crisis that is first manifesting itself in Greece. A number of media outlets have spoken to this.

We had a CBS-AP report, "Greek Debt, Trader Error Eyed in Market Selloff," on May 6th: "Traders were not comforted by the fact that Greece seemed to be working towards a resolution of its debt problems. Instead, they focused on the possibility that other European countries would also run into trouble."

Wall Street Journal: "Many traders worried about the economic situation in Europe. The Dow had already been moving lower as television screens displayed scenes of rioting on Greek streets."

Fox Business quoted a managing director of Nye Capital Partners: "The tone and tenor of the global debt crisis has taken over the market. Everything else has taken a back seat."

So there is an open question among many in our investing public whether or not we are on the road to becoming Greece ourselves, given that the deficit has increased tenfold in just 2 years, and the President has put forth a budget that will triple the national debt in 10 years. There is fear that Greece is the preview of coming attractions to the United States, and no matter how many well-designed exits you have, no matter how many well-trained ushers you have, no matter how well-designed your exit plan, if people in the theater sense that something is smoldering, you cannot ultimately remove the conditions of panic.

Thank you, Mr. Chairman. I yield back.

Chairman KANJORSKI. Thank you, Mr. Hensarling.

We will now hear from the gentleman from Georgia, Mr. Scott, for 1 minute.

Mr. SCOTT. Thank you, Mr. Chairman. I think what we have here is a clear example of how we as a society have become more the servants of the machine that was created to serve us. Our technology has now far surpassed our human ability to keep up with it.

I think we have to move with caution, to make sure we get the right causes of this problem, to understand that our foremost obligation at this point is to make sure we have investor confidence, that the American people have confidence in our system.

So it is important that we listen to you: The Securities and Exchange Commission, you have to make it work; the Commodities Trading Commission; NASDAQ; the Chicago Mercantile Exchange; and, of course, the New York Stock Exchange.

But we have a very complex system. We have nearly 50 markets. We have hundreds of millions of computers that are making these sales in megaseconds, far outpacing our human capacity to deal with it. If we do get the circuit breaker concept, we have to make sure how that is going to work. Will it do the job? What is important here is to move carefully and thoughtfully to get the right correction to this problem. The American investors and the world investors are depending on us.

Chairman KANJORSKI. Thank you, Mr. Scott.

We will now hear from Mr. Perlmutter for 2 minutes.

Mr. PERLMUTTER. Thank you, Mr. Chairman. I just would like to remind the committee and the panelists that in the financial reform bill that we passed to the Senate, we were sort of directed to this nanotrading high-frequency trading issue by some of our prior hearings; and there is a section of the bill, section 7304, asking the SEC and other regulators to take a look at high-frequency trading and its impact upon the markets. The good news is, it is in the bill. The bad news is that Thursday hit us before there was any action on the bill.

I know that the regulators have been looking at this under their own authority, and I would encourage them to continue to do this. I am surprised by my friends on the other side of the aisle who question whether it is too early to look at this. We should be looking at this high-frequency trading; 5,000 trades per second, how do you manage something like that? That is the real question. In the blink of an eye, by a mistake or by an intentional act, whatever it might be, boom, this country lost \$1 trillion over 20 minutes.

My friends on the other side of the aisle complain about the spending and all this stuff by the Obama Administration; when, because of failures in the market, because of sales and failure of the uptick rule, not having those kinds of things, we lost \$17.2 trillion in the last 18 months of the Bush Administration. Since the Obama Administration has come in, we have gained about \$6.5 trillion back. We lost \$1 trillion last Thursday, and then have gained most of that back.

There has to be a real good understanding of the algorithm-driven nanotrading that we have. It has benefits, Mr. Hensarling is right, the liquidity that it brings. But certainly if you were on the wrong side of that sale, you lost a lot of money, and we can't have that in this system.

I yield back, Mr. Chairman.

Chairman KANJORSKI. Now, the last presenter, Mr. Foster, for 2 minutes.

Mr. FOSTER. Thank you. I want to thank the chairman for holding this important and timely hearing.

As a high-energy particle physicist, I spent many years programming and debugging large systems of high-speed digital logic computers. So the fact that large interconnected processing systems, individually programmed by very smart individuals, exhibit complex and erratic behavior when they are simply thrown together, does



not surprise me at all. However, the fact that these complex systems are put in control of a large and important section of our economy, without sufficiently robust testing of their interoperability and immunity to coherent instabilities is an outrage.

The absence of systemwide circuit breakers to limit the damage when a single element or set of elements malfunctions is indefensible, as is the absence of uniform legal clarity when it comes time to bust trades that have been made on a clearly erroneous basis.

Part of the problem that we are facing is the mismatch between the time scales of human thought and machine action. While the logic of circuit breakers and market pauses to restore liquidity has been understood for decades, we see now that it must be implemented on a time scale of computer trading and it must be implemented uniformly across a wide variety of trading platforms.

The race towards lower latencies and higher-speed trading shows no sign of abating. Startup companies are already developing trading and matching engines based not on clusters of computer servers, which will be too slow to compete, but on dedicated pipeline logic based on field-programmable data arrays that will typically perform a dedicated calculation 100 times faster than a dedicated computer processor.

In particle physics, these venues for years have been used to perform specialized calculations at high speed. I have personally spent years using them to stabilize large numbers of particles traveling near light speed around the circumference of a giant particle accelerator.

So while a market pause of 5 seconds may be appropriate to restore liquidity for today's trading algorithms, using today's technology, a market pause of only 50 milliseconds may be appropriate when the next generation of technology comes on line. We have to stay ahead of the technological curve and have to institutionalize appropriate interoperability and stability tests before new components and algorithms are brought on line.

The reason that secondary capital markets exist is to provide a reliable and transparent means for investors to appropriately profit from their wise investments in the real economy. Events like those of last Thursday where \$1 trillion disappeared and then reappeared in the financial markets destroys that transparency and destroys confidence and are simply unacceptable.

I thank you, and I yield back the balance of my time.

Chairman KANJORSKI. Thank you, Mr. Foster.

Now, we will move to the panel. But I want to make an observation that the issue is not one of decline in stocks. The issue is volatility. While some stocks like Accenture fell from \$40 a share to just pennies, others, like Sotheby's, soared. On Thursday, the Auction House reported a \$2.2 million quarterly loss. Its shares went from \$34 to over \$100,000 within minutes. Something was clearly wrong.

That is the reason that some 2 hours after that break, Chairman Schapiro, I had the pleasure of calling you, and you were so kind as to take that call, where we could structure this public meeting.

I say that because, as you know, I stated to you I thought that we would have a much more disturbed population as a result of the happenings on Thursday. I am happy that it does not seem to re-

flect that in the marketplace. But I am sure that has something to do with the way you and Mr. Gensler as regulators have handled this and publicly stated what you are doing.

So I commend you. I thank you for taking the time out to take the call on Thursday and to be here today on such short notice.

Now, we are going to charge you with the opportunity within the next 5 minutes of reducing your statement to 5 minutes, as best as possible, and tell us in its entirety what caused this problem; what can be done about this problem; and how we can get started.

We now would like to hear from Chairman Schapiro.

Accompanying Chairman Schapiro is Mr. Robert W. Cook, Director of the Division of Trading and Markets, United States Securities and Exchange Commission.

**STATEMENT OF THE HONORABLE MARY L. SCHAPIRO, CHAIRMAN, U.S. SECURITIES AND EXCHANGE COMMISSION, ACCOMPANIED BY ROBERT W. COOK, DIRECTOR, DIVISION OF TRADING AND MARKETS, U.S. SECURITIES AND EXCHANGE COMMISSION**

Ms. SCHAPIRO. Thank you, Mr. Chairman. I hope I won't disappoint you.

Chairman Kanjorski, Ranking Member Garrett, and members of the subcommittee, I appreciate the opportunity to testify concerning the market disruption that occurred last Thursday. As you mentioned, I am joined today by Robert Cook, the Director of the Division of Trading and Markets at the SEC, who has been deeply involved in the analysis of the market events.

The sudden evaporation of meaningful prices for many major exchange-listed stocks in the middle of the trading day is unacceptable and clearly contrary to the vital policy objective of maintaining fair and orderly financial markets. The SEC is working around the clock to identify the causes of this sudden spike and to make changes which will help prevent disruptions of this type in the future.

On May 6th, the Dow Jones Industrial Average dropped more than 573 points in just 5 minutes. As quickly as the market dropped, it suddenly and dramatically reversed itself, recovering 543 points in approximately a minute and a half. Many individual securities experienced much larger swings in their trading activity and certain trades were executed at absurdly low prices.

Pursuant to exchange rules, after closing, the equity markets worked out a common standard to cancel trades effected at prices sharply divergent from prevailing market prices. The exchanges determined to cancel any trades from 2:40 p.m. to 3:00 p.m. at prices 60 percent away from the last trade at or before 2:40 p.m.

Today, the SEC has more than 100 people working tirelessly on this issue. We are sorting through literally millions of trades and carefully comparing timing and activity across markets to isolate the cause or causes of the spike. We will take action to change any aspects of our market structure which may have contributed to the extreme volatility.

We have made progress in our ongoing review and can provide some preliminary findings.

First, while we cannot yet definitively rule out the possibility of a “fat-finger” error, our own review and reviews by the relevant exchanges and market participants have not uncovered such an error.

Second, there have been reports that one or more exceptionally large orders in certain stocks may have preceded and helped to trigger the broader decline. However, there does not yet appear to have been any unusual prior securities trading that would have triggered the broader market decline.

Third, while some have focused on the role of the E-Mini S&P 500 future in leading the market decline and recovery, it must be recognized that the fact that stock prices follow futures prices chronologically does not necessarily suggest what may have triggered the price movements. Given that the E-Mini futures price fell by more than 5 percent in a few minutes and then quickly recovered all of the 5 percent decline, it should be no surprise that the broader stock market indices showed similarly fast and similarly large declines and recoveries.

Finally, at this time we have not identified any information consistent with computer hacker or terrorist activity.

Ultimately, we may learn that the extraordinary disruption in trading was the result of a confluence of events, which, taken together, exacerbated what already had been a down day and led to an extraordinarily steep price drop and recovery. However, we continue our efforts to identify the triggers and will share them with the public as they are identified.

Earlier today, the SEC and the CFTC announced the creation of an advisory committee that will, among other things, work with us in reviewing appropriate regulatory changes in response to the events of May 6th, and the staff of our agencies intend to provide that committee with our preliminary findings next week.

Last Thursday’s events could be likened to many dominos falling, and while we are all understandably focused on why the first domino fell, it is equally important to understand why so many others fell as well. I believe we will eventually pinpoint the triggering events, but it is fair to say that disparate exchange rules and trading conventions caused many more dominos to fall than should have.

For this reason, the SEC convened a meeting yesterday with the leaders of six exchanges and FINRA, where we agreed to strengthen cross-market circuit breakers, circuit breakers that will not unnecessarily interfere with market activity, but that will pause trading while the markets check for technical problems and recover liquidity.

We also reached general consensus on the need for stock-by-stock circuit breakers. I expect later today we will further refine when those circuit breakers might be triggered and for how long.

Further, we are also committed to creating a sound framework for better handling the breaking of erroneous trades.

I believe all these actions can help to prevent a repeat of Thursday’s remarkable market volatility. But these are only interim steps. We must quickly consider what additional steps are necessary to strengthen our market structure and minimize future disruptions.

We have already launched initiatives that will address many of the issues illuminated last week. Earlier this year, we issued a concept release on market structure that solicited public comments on steps to minimize short-term volatility and systemic risk. We also formally proposed creating a large trade reporting system to enhance the Commission's surveillance and enforcement capabilities. And we have proposed strong broker-dealer risk management controls when a broker allows a customer direct access to our markets.

In order to help regulators keep pace with technology and trading patterns, we have also been working on a proposal to create a consolidated order tracking system, or consolidated audit trail. Within the next few weeks, I expect the Commission to consider this proposal, which would capture all the data needed for effective cross-market surveillance. This will significantly improve our ability to conduct timely and accurate trading analyses for market reconstructions and complex investigations like that which is currently underway.

In conclusion, the SEC is making progress in its ongoing review. We will ultimately find the cause or causes of the disruption and will put in place safeguards that will help prevent the type of unusual trading activity that occurred last week.

I look forward to working with you on these issues in the coming weeks, and, of course, we would be pleased to answer any questions.

[The prepared statement of Chairman Schapiro can be found on page 114 of the appendix.]

Chairman KANJORSKI. Thank you very much, Madam Chairman.

Next, we have the Chairman of the Commodity Futures Trading Commission, Chairman Gensler.

Incidentally, Mr. Gensler, thank you very much for responding, too, as quickly as you did. Fortunately, I did not have to call you, because I did not think it stretched to the futures market. That becoming apparent, it is good that you can be here as a corollary regulator so we can get to the bottom of this.

Mr. Gensler, you are under the same restrictions, hopefully to give us about a 5-minute presentation so we can get to questions.

**STATEMENT OF THE HONORABLE GARY GENSLER, CHAIRMAN,  
U.S. COMMODITY FUTURES TRADING COMMISSION**

Mr. GENSLER. Thank you, Chairman Kanjorski, Ranking Member Garrett, and members of the subcommittee. I am pleased to be here alongside SEC Chair Mary Schapiro, with whom we have been working very closely and diligently since last Thursday to explore and see what we can find out about the events.

Before I turn to those events, let me just say something about the stock index futures market. Stock index futures trade on centralized exchanges and they are based upon the broad market index. The total outstanding is about \$360 billion. This compares to the approximately \$13 trillion of the overall equity markets; however, stock index futures do play an integral role to the pricing of the overall market. The largest contract, the E-Mini S&P 500 contract, trades on the Chicago Mercantile Exchange. It is about 80 percent of that market, and we will focus on that a little bit in our testimony.

There are procedures on that contract, and I want to mention four quick procedures that are risk-management procedures to ensure the orderliness of the market.

First, electronic trading systems on all of the markets for these contracts reject orders priced outside of a narrow band, about a 1 percent band up or down.

Second, the exchanges actually have maximum order sizes. Congressman Royce mentioned something from years ago, but today, only about a \$100 million transaction can be entered. The average transaction, though, in the E-Mini is about \$330,000 in size.

Third, exchanges have something that limit stop-loss orders, and I can get more into that in the testimony.

Fourth, they also have something which is a market pause, a 5-second pause if the order book gets out of balance. In fact, last Thursday, that 5-second pause occurred exactly when the market bottomed.

In terms of the preliminary review, we are looking at millions of trades. The CFTC, fortunately, has all of the trading data entered into our systems by the very next morning because under our act, we are able to get that from the exchanges. I think it would be good, and I know the SEC is working on that, but the staffs of our agency, the SEC, and the exchanges have looked at it and it is a very ongoing process.

Let me mention four things, though. May 6th started turbulent. You can think of an airplane in turbulent skies. It was very turbulent that day with the economic news emanating out of Europe. Volatility pricing was pricing up. It had actually gone up about 60 percent interday from Wednesday to Thursday on some measures.

Further, the futures markets and other markets are so intertwined that stock index futures looked to other price signals from all of the other markets, and there were a lot of markets coming in with signals that were showing risk premiums were widening. Currency markets were volatile, and small capitalization equity securities began declining sharply. Between 2:00 p.m. and 2:20 p.m. East Coast time and by 2:24 p.m. East Coast time, there were 8 securities that were exchange-traded securities that were already off 50 percent in the preceding 24 minutes.

Other price signals started to come in after 2:30 p.m.—some of the large markets started to delink under what is called a self-help program that you will hear about a little later, NASDAQ and some of the others. So some of these signalings kept coming in.

Our own review of trading data shows that somewhere starting around 2:40, some of the most actively traded participants in the futures market, the high-frequency traders, started to limit their participation around 2:42, 2:43, and so forth; and that is exactly when that V was happening as some people were limiting or even withdrawing from the market.

Another factor, in the midst of this, one large investor executed a hedging transaction, a bona fide hedging transaction in the E-Mini, in the size that on normal days would move through the market. It was about 9 percent of the volume during the period down and up. But that was also—and may have had some participation within this.

So between 2:40 and 2:45, the market did go down 5 additional points. At 2:45 and 28 seconds, this 5-second pause happened on the Chicago Mercantile Exchange. This was so the order book could get sort of rebalanced in the computer, and in fact, that was the bottom. The SPDR, which is the exchange-traded fund that is a security but trades in the market, bottomed 7 seconds later. The cash markets bottomed all in the next minute, the 2:46 minute. And then you saw the market move back up.

Exchanges and market participants have asked this question about a "fat-finger" mistake. The exchanges have looked at it closely. We have reviewed some of their work, of course, and have not found the "fat-finger" issues, similar to what Mary said earlier in that regard.

Despite the high volatility, the clearinghouses and the settlement and the margin posting all worked, both Thursday and Friday. So the plumbing or the backside of this worked. But we continue to review May 6th with the SEC, particularly how the S&P futures traded in relation to the cash market and, to the extent of that trading, keyed in on some of the other indices. And as Mary said earlier, we set up this morning a joint advisory committee that will be issuing a preliminary staff report early next week and hopefully convening that committee to actively look at recommendations.

With that, I look forward to working with this committee and taking your questions.

[The prepared statement of Chairman Gensler can be found on page 85 of the appendix.]

Chairman KANJORSKI. Thank you very much, Mr. Chairman.

I will take the first set of questions.

I think I heard you say, Madam Chairman, that there will be an answer to this within a reasonably short period of time, within a matter of weeks. Is that what you anticipate?

Ms. SCHAPIRO. I didn't actually give a timeframe. I said we will get to the bottom of this. I think we will be able to determine what the initial triggers were. That is going to take time. There were 66 million trades on May 6th, covering 19.5 billion shares of stock.

You think about what happened in 1987 when the market had its largest move in history and the Brady Commission was created. There were a tiny fraction of the number of trades that we have experienced today, about 600 million shares of stock compared to 19 billion shares. So that took several months with a dedicated group of people working on it.

We will move as quickly as we can, but I can't give you a date when we will have any final answers. But we will. We will make them public. Next week, we plan to give preliminary findings to our new advisory group, and we will make those public at the same time.

Chairman KANJORSKI. That is a very important question. In order to have the stability in the market, I think that we should not withhold anything from the public, because if we do, we are apt to get all the conspiracy theorists very busy and very active, and, as you know, you could imagine almost anything. But you cannot rule out any particular cause at this point; is that correct?

Ms. SCHAPIRO. I think that is fair to say. We have not found evidence of terrorist activity. We have not found evidence of computer

hacking or a “fat finger” or a particular large trade that drove the markets initially. But we are not ruling anything out at this point. And that is one reason we want to make some preliminary findings available next week, so the public can have confidence that we are moving forward.

Chairman KANJORSKI. What is the possibility that tomorrow the same thing could happen?

Ms. SCHAPIRO. I have to say it is not impossible. There is no reason to expect that it would happen tomorrow. But that is one reason, with quite a sense of urgency, we brought all of the markets to Washington yesterday to start to work on some solutions to the problem, focusing in particular on stock-by-stock circuit breakers.

Chairman KANJORSKI. So it is reasonable to assume, without knowing the absolute cause of this event, you could put new rules in place and organize the regulators and the markets to prevent a similar occurrence of this in the future, even before we get to the final cause?

Ms. SCHAPIRO. Exactly. I think it is important to understand the initial cause or triggering events. I think it is critical. We know what the damage was that was done. We need to put in place the mechanisms that can prevent that from happening again, while we continue to diagnose the source of the problem.

Chairman KANJORSKI. I will ask this as a joint question between the two of you, but do you have any suspicions that it was done for profit or some other means by a group or conspiracy group of any kind, or is this just a glitch in your opinion, if you have one?

Ms. SCHAPIRO. I don’t think we have evidence—and, of course, I will let Chairman Gensler speak to this as well—that this was done in any kind of a malicious way. I think what my inclination is is that we have a widely dispersed equities market in the United States, several members have mentioned the number of trading venues, and we had different rules and conventions applying in those different markets that allowed for activity to be transmitted rapidly from one place to another without everybody following the same protocols.

Mr. GENSLER. We may find that there is something that our enforcement arm has to take up, and we have been very active as of Thursday afternoon putting out a special call under our act to large participants. There are about 250 participants in this E-Mini contract during the course of the critical 20 to 30 minutes. We have been investigating most closely the 10 largest shorts and the 10 largest longs in that market, but we are looking at others as well.

I think it was sort of the turbulence in the skies added with a lot of signals that were coming in, that markets do work on, as they say, fear and greed, and in those critical moments, I think in a sense, the fear took over. There was a second factor, that individual stocks were breaking further down, and that is an issue that we are talking about.

Ms. SCHAPIRO. Mr. Chairman, if I may add, we have fully integrated our enforcement group as well into the analysis, and they have sent out a number of subpoenas so that we can look at particular activity in very granular detail. Of course, if there is anything there, we will be following up on it.

Chairman KANJORSKI. As you know, we have passed in the House the regulatory reform bill and it is now pending in the Senate and being acted upon. There have been some individuals, particularly some United States Senators, who have suggested that there may be a remedy to be had that we could include within the reform, regulatory reform provision.

Do you see that as a possibility? I guess the open question I want to ask: Do either of you see a need for additional authority as regulators to ultimately get to the solution to this problem?

Ms. SCHAPIRO. I think, Mr. Chairman, that we believe we have the authority that we need with respect to the issue of circuit breakers and potentially imposing stock-by-stock circuit breakers. We certainly have the authority we need to create and develop with the markets a consolidated order audit trail which will facilitate our work greatly. And the other issues that come out of the events of Thursday, looking at whether market orders should be limited in certain circumstances or how do we deal with canceled trades going forward, I think we believe we have the full authority we need there.

Coming out of our broader review of market structure, it is possible that we will need to come to Congress for some kind of authority, but I can't even predict at this point what that may be.

Mr. GENSLER. I would say, Mr. Chairman, I think that since markets are so interrelated—securities, futures, but also the over-the-counter derivatives marketplace—I think the reform this committee has moved and hopefully Congress will move on over-the-counter derivatives will give us a greater window, because right now, our full review is on the listed securities and, of course, the futures markets, but not the over-the-counter derivatives that may have played some role on Thursday as well.

Chairman KANJORSKI. Thank you very much.

Now, the gentleman from New Jersey, Mr. Garrett.

Mr. GARRETT. Thank you, Mr. Chairman, and I thank the panelists again.

Just following up along that last line, I guess I was a little confused by some of the comments from the Senate, which often happens, as well. You had Senator Dodd saying we need to get in place our bill, meaning the bill you just referenced, and have the President sign it so we can have the tools to protect our economy from these kind of events, sort of implying that we do need to pass that legislation and give you that authority.

Then, in the same breath, he also said, "I don't think you need the legislation in this area." My guess is you need the regulators to step up and make sure that this high-frequency trading, this flash trading that is going on, that is something that clearly we ought to take a look at.

So on the one hand, he was saying we need more statutes and more laws, but on the other hand, I think he recognized what you just said, Madam Chairman, that you have the authority in all these areas to address the situation.

Ms. SCHAPIRO. We believe we have the authority to address these events. Again, there may be issues that arise as we work through the market structure concept release, all the many issues we have raised there with respect to high-frequency trading, volatility, and



other matters that might require us to come to you for legislation. But with respect to these issues, and circuit breakers in particular, we have a high level of confidence.

Mr. GARRETT. Let's go to the circuit breaker situation for just a second. I was just in Manhattan yesterday, meeting with a number of my constituents who work in that area, and there are, as you can anticipate, a number of rumors that are out there right now. So maybe you dispelled one, and that is that it was hackers. Maybe you can dispel another. But will you be using your emergency authority in order to implement these rules? That will be the first question.

Ms. SCHAPIRO. First of all, we don't have final rules constructed yet. And, one of the reasons we brought the markets to Washington to discuss here in some detail and then to charge them with going off and coming back with recommendations is that we want the deep expertise and knowledge that they have from running marketplaces every single day.

I think we are likely to do this through exchange rule filings primarily that would come to the Commission for approval. We understand the need for adequate time for programming computer systems, and for educating other market participants with respect to how the rules would operate.

Mr. GARRETT. Okay. I will just throw out—here is an easy one probably, as far as the rumors that are out there, is that if you were going to suggest circuit breakers as far as percentages of deviation of around as small as 2 percent, where some of those traders would say that's just woefully too low.

Ms. SCHAPIRO. We very much understand that issue. And that is why again the exchanges are really assisting with how to fine tune both the level of change in the stock price, over what period of time, whether it's done off a rolling average or off the prior day's close, and then what period of time for a pause that gives the human being a sufficient amount of time to make decisions that they need to make about whether algorithms are not operating correctly, whether there is additional liquidity that can be brought into the marketplace. So those are all the issues we are discussing.

Mr. GARRETT. I thought that was a simple question. So the answer is, "maybe?"

Ms. SCHAPIRO. There is complexity to it. So I can't tell you it would be 2 percent over 5 minutes in price changes. We are just not at that point yet.

Mr. GARRETT. Okay. Now, you also said, you all there at the table, have set up a joint advisory committee? I am not sure—

Ms. SCHAPIRO. That is right.

Mr. GARRETT. That is right, a joint advisory committee? And who all is on that joint advisory committee?

Ms. SCHAPIRO. We selected people who have expertise in markets and market microstructure in particular. So we have two former CFTC Chairs: Susan Phillips, who was actually the first woman appointed to Chair of a financial regulatory agency at the Federal level by President Reagan; and Brooksley Born, also a former CFTC Chair. We have David Ruder, a former SEC Chair who went through the market break in 1987 and its aftermath; Jack Bren-

nan, the former CEO and chairman of Vanguard, a very large institutional investor.

Mr. GARRETT. I think my time is running out. Just quickly, do you have any current market participants other than—

Ms. SCHAPIRO. Actually, we have a current market regulator, Rick Ketchum, who spent time at both NASDAQ and the New York Stock Exchange. We did not want to have people who have a very direct vested interest in advising the Commission, although this group's deliberations will be fully in public and all of our meetings will be public, but we tried to pick people, particularly the academics, Maureen O'Hara from Cornell, Robert Engel from NYU.

Mr. GARRETT. It might just be good to have some of the participants who are actually involved and up-to-date—

Ms. SCHAPIRO. They are very involved. They will present to this group. They will submit information to the group.

Mr. GARRETT. One last—but you get my point on that area, my concern there?

Ms. SCHAPIRO. Yes.

Mr. GARRETT. And in the last 10 seconds here, the chairman indicated that he phoned you about 2 hours after this all occurred. You are now asking the participants, the regulated entities, to respond back in 24 hours from yesterday. One of the questions I had over what happened yesterday is, if Congress could call you within 2 hours to begin the process to find out what's going on, did you have the authority actually to e-mail out immediately to all 40 or 50 entities and say, we want to have an answer back from you just like you did yesterday from them?

Ms. SCHAPIRO. I spoke with the heads of the major exchanges on Thursday, through Thursday evening, all day Friday, and our staffs were in minute-by-minute contact virtually the entire day Saturday and Sunday. I did not want to bring them to Washington on Friday. I thought they needed to be there when their markets opened to handle any other fallout or issues that might have come from Thursday. But Monday morning was a good time. I wanted everybody in the room together. I didn't want ad hoc e-mails with loose ideas. I wanted people together so that we could think through what the issues were and how we might best solve them as a group.

Mr. GENSLER. And we, too, were talking directly to our exchanges by 1 a.m., which, I guess, would have been Thursday night. On Friday, we had our first memo from the Chicago Mercantile Exchange analyzing this contract. We had the entire data set loaded into our computers by 9:30 Friday morning.

Mr. GARRETT. Okay. I appreciate that.

Chairman KANJORSKI. The gentleman's time has expired.

Now, we will hear from the gentleman from California, Mr. Sherman.

Mr. SHERMAN. Thank you, Mr. Chairman.

Volatility leads to perceived risk. Perceived risk leads to higher cost of capital for real businesses in the real America. If we had markets in which all the profits accrued to real investors, I think that would be appealing to those making real investments in real American companies. In contrast, a market in which Procter &

Gamble can drop to 1 cent is not appealing to those who want to provide real capital to real companies.

Most of the testimony here simply assumes that we are going to let people keep doing what they are doing unlimited and untaxed and we are going to patch up the system in the hope that it won't happen again. This is like the reaction if we had an unplanned explosion of nitroglycerin. If that explosion took place in a mining operation or something else socially useful, we would say, let's have better regulations so that we can get that social utility of the nitroglycerin without having it explode in an unplanned way. But if this inherently risky nitroglycerin had an unplanned explosion because kids or gamblers were playing with it, we might instead say, how can we somewhat reduce the risk of an inherently risky activity? We would ask, why are we allowing this activity to take place? So it raises the question of whether high-frequency trading serves a social purpose.

Imagine—Chairman Schapiro, imagine if somehow by magic we created a world in which those investing in U.S. stocks actually held them for a couple of hours before they sold them or went short for a couple of hours before they covered, and let's say that applied to Procter & Gamble or 3M. How would the employees of Procter & Gamble or 3M—what catastrophe would they face if the stocks of their companies were not subject to high-frequency trading? Would that help those employees in those operating companies, or would there be some cataclysmic problem if high-frequency trading did not apply to those companies?

Ms. SCHAPIRO. Congressman, let me first of all agree that the purpose of our capital markets is to help companies raise capital to create jobs, to help our economy grow, and that investors who commit their capital to those markets get to share economically in that growth and development. We have lots of questions about high-frequency trading and its role in our capital markets. It's one reason we have exposed many of the issues related to high-frequency trading for public comment and—

Mr. SHERMAN. Madam Chairman, I know you have many questions. I have one question, and it is my time. What catastrophe would occur to the employees of Procter & Gamble if the stock of that company was not subject to high-frequency trading?

Ms. SCHAPIRO. I don't know that any catastrophe would. There are those who will argue perhaps on the next panel that high-frequency trading adds significant liquidity in the marketplace so that when those Procter & Gamble employees want to sell, it is easier for them to do that.

Mr. SHERMAN. Now, to what extent do you agree with the view that those high-frequency traders are just parasites on the market? You have a market in which real investors are buying and selling and then people come into that market and grab a little piece of the profit for themselves who are not engaged in real investing.

Ms. SCHAPIRO. I guess I can't really answer that question.

Mr. SHERMAN. So they may be parasites; they may not be. And I will ask you to answer that for the record because I am going to go on to the next question. Would a tax of 1/20 of 1 cent per \$1,000 be sufficient to disrupt the business model of those who are en-

gaged in high-frequency trading so that they would substantially diminish the amount of high-frequency trading?

Ms. SCHAPIRO. I honestly don't know the answer to that question; so I will be happy to think through and—

Mr. SHERMAN. I will ask you to think it through, and then we will have the argument that if we don't have the casinos on our Main Street so they will play the casinos in Monte Carlo, but I would say that if all the American markets trading American stocks were insulated from most of this high-frequency trading that is where real investors would want to go, and if over in Dubai, somebody wants to bet for a millisecond on what happens on the U.S. markets, at least it is not American minds, American computers, or the American markets put at risk. And I believe my time has expired.

Chairman KANJORSKI. Thank you very much, Mr. Sherman.

Now, we will hear from the gentleman from Alabama, the ranking member of the full committee, Mr. Bachus.

Mr. BACHUS. Thank you, Mr. Chairman.

When the steam engine came along, it hit a lot of livestock and a lot of the farmers thought that they should probably do away with the steam engine. It also set fire to some of the fields. But we figured out some preventative measures, and we have done okay with it. Of course, it was replaced by the diesel engine, and a lot of people thought that was a setback. I kind of think high-frequency is not such a bad thing.

As I said in my opening statement, you identified some of these problems back in January and started asking for public comment, which is what we have always heard you to do. So I think you have your hands around the problem. How do you—we have gone from a highly structured duopoly, NASDAQ, not with options, but with NASDAQ and the New York Stock Exchange. The 40 or now what I am now hearing 50 different trading platforms. How do you ensure the integrity of the markets price discovery without hurting competition and without degrading those individual models which all have their strengths and weaknesses. So I would ask both chairmen.

Ms. SCHAPIRO. It is a great question because there are clearly challenges associated with our highly automated and highly disbursed and fragmented marketplace. And I think the way we ensure integrity is to have those markets linked so investors' orders get the best execution that they can, and that is a requirement under Regulation NMS. But looking forward what we have to do is make sure that the markets are operating under basically the same rules so that an investor is not disadvantaged by trading the same stock in different venues. They should be able to get the best price wherever they are. And I think the issues that are highlighted by Thursday, many of them are addressed—not solved but addressed well by the creation of single stock circuit breakers that would allow for the times when the technology gets ahead of the people by too much, to take a time out and refresh the marketplace. But we have raised so many of these issues in our market structure concept release because we really do want to explore them in a thoughtful way.

While we do that, there are some short-term things I think are very important for us to do. The circuit breakers are among those. Dealing with direct access by customers into the exchanges is something I think we need to deal with and some issues around dark pools of liquidity and the use of flash orders and others, all of which we have under consideration right now.

Mr. GENSLER. And I just think that—although it is outside of my lane a bit, that it is really important that those 40 or so venues, and it may be 70 in the future, have consistent transparent rules that are available to the public. If there is a timeout or a pause, whether it is 5 seconds, milliseconds, or a minute, that it be consistently applied. If you go dark on a stock somewhere, you go dark elsewhere. You even do it in single stock futures where we co-regulate and so forth.

Mr. BACHUS. And I commend you. I used the word “address” not “solve” in my opening statement too, because I think we are trying to address them but you never quite solve all the problems. I also believe—and both you and your statements, and Chairman Gensler, you mentioned that there is already a lot of skittishness in the market, a lot of increased volatility. People are on the edge of their chairs anyway. So obviously, as I said, it created an environment. Do you think we could find—and I suspect that there is not one contributing cause of this, that it was probably a combination. Now, you could have had a large trade in the S&P 500 SPDRs and you could point to that as possibly a part of it, but that doesn’t mean that wasn’t a legitimate hedging to buy.

Mr. GENSLER. Right. I think, Congressman, in our capital markets there’s not one king or one czar or something. It is diverse. That is in a sense the beauty of markets. But I think that this was a very turbulent time. I think there were a lot of price signals by 2:00 to 2:30 that were going negative. If it was an airplane analogy, you had the indicator lights now sending charges back. You also had one of the engines start to not run too well because liquidity was stepping out of the market. We did see by 2:40, 2:42 a number of active market makers, even these high-frequency traders were limiting their capacity. The major exchanges have said their order books seemed thinner. That means there were less bidders in it. In addition to that, you had a little extra cargo, this bona fide hedging program. It was only 9 percent of the E-mini, but it may have had some factor in this.

Mr. BACHUS. I know the SEC has addressed at least dark liquidity as part of their concept. Do you have any comment, Chairman Schapiro?

Ms. SCHAPIRO. The only thing I might add to the scenario that Chairman Gensler ran through is we also saw, because of the skittishness in the market, I think, a lot of stop-loss orders had been entered by investors hoping to limit their losses. Those were run through, and as a result, the market continued to drive down.

So one of the things we want to look at is the use of stop-loss orders and the use of market orders, which get you a fast execution, but maybe at a really terrible price, along the lines of the chairman’s comments at the very beginning. So those are two other areas.

Mr. BACHUS. It seems there should have been some obligation by the brokers not to execute an order on a \$30 stock at a penny. That is just good—I think that is a fiduciary relationship.

Thank you, Mr. Chairman.

Chairman KANJORSKI. The gentleman's time has expired.

Now, we will hear from the gentleman from Texas, Mr. Hinojosa.

Mr. HINOJOSA. Thank you, Mr. Chairman. Thank you for having this hearing.

Before I make a statement and ask some questions, I ask unanimous consent to enter into the record the Joint CFTC and SEC Advisory Committee on Emerging Regulatory Issues, dated May 10, 2010.

Chairman KANJORSKI. Without objection, it is so ordered.

Mr. HINOJOSA. Thank you.

I agree with my colleagues on both sides of the aisle that the Dow Jones Industrial Average plummeting 990 points, losing 22 percent of its total value cost caused a great deal of concern for those of us on the House Floor that Thursday afternoon. The S&P 500 dropped 20 percent, falling from 282 to 225 points, and this was the greatest loss Wall Street had ever received on a single day.

I want to ask a question first of Chairman Schapiro. Was market fragmentation a key cause of last week's 990 point drop in the Dow Jones index?

Ms. SCHAPIRO. Congressman, I don't think there is any question that the fact that we have a highly fragmented market is a contributing factor here and creates challenges. It doesn't have to be the result that we had last Thursday if the markets, while dispersed and many of them, play by the same rules and have the same trading convention, so that if all of the markets are subject to halting trading in a stock when it reaches a certain price, then I think we would not have had some of the fallout that we had last week.

Mr. HINOJOSA. Having a Brady Commission which has made lots of recommendations, tell me, have any of those recommendations been put into effect?

Ms. SCHAPIRO. Oh, yes. The actual marketwide circuit breakers that exist today were a direct result of the Brady Commission's report in January of 1988. One of the things we are also looking at jointly between the two agencies is whether those marketwide circuit breakers that have the market shutting for brief periods of time when the DOW goes down 10, 20, and at 30 percent shutting completely need to be updated and modernized, and that is an effort we are undergoing right now.

Mr. HINOJOSA. So if you could tell me the similarities then of that October 19, 1987, market crash and give me the similarities, and is that being investigated so, as you said, that it not happen again?

Ms. SCHAPIRO. Absolutely. If you look—I actually went back and looked at the Brady Commission report over the weekend and it is interesting that their findings are that there were multiple events that caused the market to decline—I believe it was 26 percent in October of 1987 on that day. And that is similar, I think, to what we will ultimately find here, that there were multiple contributing events. The difference is that trading largely took place at that time on the NASDAQ stock market and the New York Stock Ex-

change. There were not multiple trading venues, although there was trading in the futures markets that was delinked from the trading in the equity market.

The delinkage issue exists today among the equity market. So we see another similarity there. We are trying to do the same careful and thoughtful review of the events that we expect will lead us to some kind of recommendations that, while not the same as the Brady Commission, are similar in that they lead us to further elaboration on circuit breakers, for example, or order types that we might want to limit going forward.

Mr. GENSLER. I would say one thing, that 23—and I remember because I was back then in a financial firm—I think one thing is that 23 years ago, though there were computers back then, there was nothing like what we have now, and this whole concept of trading in nanoseconds and microseconds and automated traders. That is why both of our agencies have active reviews of high-frequency traders that includes looking at issues of co-location, where they put the computers, where the exchanges are, looking at issues with regard to account identification and all of the issues in terms of access to the markets of these high-frequency traders. That is something really new in this market environment from 23 years ago.

Mr. HINOJOSA. Chairman Gensler, let me ask you a question, then, with that comparison you just gave. We need the SEC and your group, the CFTC, to step up to the plate and ensure that such market disruptions don't occur in the future. Do you have enough funding and authority to prevent such an event from reoccurring?

Mr. GENSLER. I thank you for that. We are a sorely underfunded agency and actually shrunk about 23 percent in the 8 years before this Administration. With Congress' help, we are back to just about the size of we were 10 years ago, and we have put in a request, particularly if over-the-counter derivatives reform came into being to grow significantly from where we are. We do need more enforcement lawyers, cops on the beat, and we need more computer systems to try to stay up with the automated surveillance that we need of these markets.

Mr. HINOJOSA. Do you leave it to—I think my time has been exhausted, and I thank you, Mr. Chairman.

Chairman KANJORSKI. Thank you.

Next, we will hear from the gentleman from California, Mr. Royce, for 5 minutes.

Mr. ROYCE. Thank you, Mr. Chairman. I think it was a London economist who wrote—gave us a British perspective. They said when Congress doesn't understand or like something like work or investment, Congress has a tendency to further tax it or legislate it out of existence, and I was reminded about that when the legislation was referenced earlier. And I wanted to ask Chairman Schapiro—there is legislation here in Congress for a transaction tax on every financial transaction, and I was going to ask you, is the solution to slow our markets through this transaction tax on financial transactions, or is the solution to speed up our protections through real-time circuit breakers? I had mentioned earlier in my opening remarks the concept that Germany has employed with respect to looking at individual stocks.

If individual stocks fall more than 5 percent in 5 minutes, then you have those circuit breakers go into effect until the markets have sorted it out. And it just seems to me that if we put this transaction tax on trading, what we are really going to do is provide less liquidity, and I wanted to ask if that is a valid concern there and your thoughts.

Ms. SCHAPIRO. Let me, say I have studied the Deutsche Borse individual stock mechanism, and it informed very much our conversation that we had with the exchanges yesterday because my personal view is that if we can do circuit breakers on individual stocks, depending upon the velocity with which they are declining in value, it will allow us to take a timeout for some period of time, and that every market must honor that timeout, we will have done a lot to make a difference here.

And I think it is important for us to do that in relatively short order. I guess tax policy is way beyond my pay grade and really my depth, but I don't—I just don't have a view, I guess, about whether imposing a transaction tax would be an effective mechanism to slow the market or not. I don't know what the impact necessarily would be on high-frequency or algorithmic traders.

Mr. ROYCE. My colleagues have brought it up on the other side of the aisle, so I thought I would pursue that. But let me ask you another question and that goes to the events on Thursday. Does this situation justify looking at trying to put all of the markets under one regulator? You have equities, options, future markets—they are all interconnected. They are all correlated against each other. And we passed a regulatory reform bill out of the House last year which I think moves us in the right direction, but you still have two separate agencies with two separate sets of rules, and I just think about some of the studies that I have seen where whether you are liberal or conservative or in the center, these think tanks and economists that have looked at this have all asked the question, if you have the same entities trading the same products but two different regulators with two different sets of rules, aren't you compounding the difficulty here and isn't this simply the result of not being able to move forward with real world-class regulation? So I would like to ask you, Chairman Schapiro, for your view on that.

Ms. SCHAPIRO. Certainly. Let me just say that the SEC does have jurisdiction over all of the equity and options markets; we don't over the future markets. And I know Chairman Gensler has heard me say this before, that I think if we were writing on a clean slate, we would not create the regulatory structure around these instruments or these market participants that we have today and that there would be efficiencies gained by merger of the two agencies. But I want to hasten to add that I—and I was CFTC Chairman quite a few years ago and I have been around both agencies for many years. Never in the history of either of those agencies have I seen closer collaboration or cooperation or willingness to support each other as we try to get done these things that we think are important in each of our marketplaces. So while we don't have a merged agency, I think we have very—the next best—

Mr. ROYCE. Very good. Let me quickly ask you my last question: Is there any evidence that the uptick rule would have prevented



this calamity on Thursday? I recall reading an SEC study which said that there's no way that the uptick rule in today's markets could be of assistance, but what is your view on that?

Ms. SCHAPIRO. As you know, we did pass a new version of the uptick rule, a short sale circuit breaker rule that is not in effect yet, and won't be until November. It is possible new rules may have helped to the extent short sellers were active during this time period, but what we actually understand is that the level of short selling as a percentage of trading volume during that critical 30 minutes from 2:30 to 3:00 was lower than it was at other times during the day. So to the extent the sales we saw were long sales, the uptick rule would not have made a difference.

Mr. ROYCE. So it really seemed to be a lack of liquidity problem?

Ms. SCHAPIRO. To the extent they were short sales and probably something we are looking at, it might have made—it might have had some impact.

Mr. ROYCE. Thank you very much.

Chairman KANJORSKI. Thank you very much, Mr. Royce.

And now, the gentleman from North Carolina, Mr. Miller, for 5 minutes.

Mr. MILLER OF NORTH CAROLINA. Thank you, Mr. Chairman.

I assume that the value to our economy of securities markets is that it matches people with money to invest with people who can put the money to productive use, and the usual justification for high-frequency trading is that it adds to liquidity. And I could understand, for instance, that someone who thought they might buy a house for an investment but might need to sell it would be reluctant to buy a house because they might have trouble selling. But I really don't think, before high-frequency trading, that there was that much difficulty in unloading a stock.

Is there any evidence that people are more willing to invest in stocks now because of increased liquidity, that people who really want to buy and hold a stock who actually want to own the company?

Ms. SCHAPIRO. I don't want to dodge your question, but I do want to say this is exactly the kind of issues we are looking at in our high-frequency trading release, the issues that we published for public comment and public dialogue. And we want to understand, what is the role of high-frequency trading? Is there a benefit to our marketplace? Are the interests of high-frequency trading aligned with long-term investors or are they at odds with long-term investors? And if so, because our markets serve the purpose of, just as you say, allocating capital to useful endeavors and to creating jobs, we want to make sure nothing is detracting from that. So we are doing a very deep dive. The comment period just closed about 2 weeks ago, and we are working through those issues now.

Mr. MILLER OF NORTH CAROLINA. A stunning number of trades are announced every day. Is there any reason to think—and I know that you are still in the middle of this—that there are more trades, more purchases every day by people who really want to own a stock, who want to buy it and hold it and invest in a company? We used to think of patient capital as being someone who would hold a stock for years. Now, patient capital seems to be a couple of hours or less.

Ms. SCHAPIRO. I don't know the answer to that offhand, but I would love to have some research done and see if we could provide you with more detail. There are—just on this 1 day last week on Thursday, there were 66 million trades and what percentage of those were long-term buyers and holders versus high-frequency traders who held instantaneously, I don't have an answer, but I would like to see if we could get one for you.

Mr. MILLER OF NORTH CAROLINA. The statistics or the estimates that I have seen are that 40 to 70 percent of all trades are high-frequency trading. Is that roughly correct?

Ms. SCHAPIRO. Yes. We have heard those numbers as high as 70 percent.

Mr. MILLER OF NORTH CAROLINA. Okay. Jon Stewart had a piece the other night showing the number of times that events in the financial markets have been called a "perfect storm," and they seem to happen every couple of weeks, which is maybe not the idea of the definition of perfect storm, which is this completely unpredictable combination of events that maybe happens every 100 years. They seem to happen every couple of weeks. In looking at what happened, can you also look at what else—it seems unlikely that this very thing will happen again, but something that we had no reason to think might happen seems to be happening with disturbing frequency. Can you look at destabilizing factors in the market generally so that maybe not this perfect storm will happen again, but other ones also?

Ms. SCHAPIRO. Absolutely, and that is part of our broader market structure review that we are doing.

Mr. MILLER OF NORTH CAROLINA. Okay. Thank you, Mr. Chairman.

Chairman KANJORSKI. Thank you very much, Mr. Miller.

The gentleman from Oklahoma, Mr. Lucas.

Mr. LUCAS. Thank you, Mr. Chairman.

And Chairman Gensler, let me thank you for attempting to track me down on Thursday evening. I was on a plane, but I appreciate your attempt to call me in my role as ranking member of the Agriculture Committee.

You mentioned earlier in one of your comments in reference to last week that derivatives may have played a role. Chairman Gensler, is that a hunch? Is that a gut feeling? Or is that something you potentially see in all those reams of data you are working through now?

Mr. GENSLER. There are derivatives that are on exchange, futures, and we can see that data. I think my earlier comment was just saying that we can't look right now into over-the-counter derivatives, and with your support and this committee's support, I think the bill that you passed out of the House last December would at least, in the future, in a similar circumstance, allow us to at least see that data.

Mr. LUCAS. Along that line, Mr. Chairman, you have always been a very vocal supporter of the mandatory exchange trading for derivatives that listed for clearing with little or no regulatory flexibility. After last week's trading activity and the listed equities market, which is, I think we would all agree, about as liquid a market as you can have, do you still believe that mandatory trading is the

sensible route to go for over-the-counter derivatives, which are very illiquid instruments? And thinking about that reduced volume and reduced liquidity, if there is a wild action or an aberrant trade, isn't the potential far more damaging?

Mr. GENSLER. I appreciate the question. I very much still am. I think that the over-the-counter derivatives market, which dwarfs the future exchange derivatives market by about 8 to 10 times the size, no small amount, I think we must bring the transparency there. Not for all contracts, however. There will be a whole group of contracts that are customized. There will be a whole group that aren't listed, even if they are clearable. But I think that for the portion of the market that can be listed and has some characteristics that will add transparency, we should have exceptions for block trading.

If somebody is doing a lower transaction, then it is just reported afterwards, just as it is in the futures and securities markets now, but I think that the events of last Thursday are important to look at. They don't change my overall view that we need to bring transparency to the off-exchange or over-the-counter derivatives marketplace where we can, not in the customized portion of the market but in the more standardized portion of the market.

Mr. LUCAS. So ultimately, when you do and your good folks over there and your friends at the SEC grind through all of this and come up with some sort of a determination, we will have a much better feel. I just personally still have to believe that having watched what the Agriculture Committee did and working in conjunction with Financial Services, trying to be a bit more flexible, a bit more rational in how we handle these derivatives, I personally think was the route to go. I know ultimately after last week, we will reassess the situation. But I just wanted your perspective on that because while both of you have indicated today there was no "fat finger," no magic mystery key stroke, no great confusion in somebody's software, nonetheless, if whatever did occur could have such an effect on the most massive, most liquid market in the world, it does cause concern for me about these other markets, these other instruments that don't even begin to approach that.

Mr. GENSLER. And that is why I think it is not only important that we have strong risk management in the clearinghouses that the Congress has been supportive of, but also that these exchanges for derivatives have very strong rules. I think the futures market has some very important guidance, the four that I have mentioned earlier in terms of not being able to put prices in in the outset of a ban; and having the pause, the 5-second pause that happened in the futures market last Thursday was, in fact, right at the bottom where the order book got refilled. And the mention that Chairman Schapiro was talking about of trying to do that across the securities markets, I support her initiative on that.

Mr. LUCAS. One last brief question. If indeed we do determine what happened, what the odds that it will be something of a proprietary nature where you won't be able to share that with all of us and the public?

Mr. GENSLER. We plan to make our findings public both to Congress and this committee. Next week will just be initial findings of staff. If there was a need to talk about individual trading, informa-

tion of individual accounts, than we would work with this committee to do that in the appropriate setting.

Mr. LUCAS. I look forward to letting the chips fall where they may. Thank you.

I yield back, Mr. Chairman.

Chairman KANJORSKI. Thank you very much, Mr. Lucas.

And now, we will here from the gentleman from Georgia, Mr. Scott.

Mr. SCOTT. Thank you very much, Mr. Chairman.

First, let me commend you, Chairman Schapiro and Chairman Gensler. Your presentation certainly gives us all confidence that you have your hands around the problem. While you are looking for the causes, you have certainly shown that you have put certain measures in place to give confidence to investors to keep on investing with confidence. It seems to me though that what we really have here is a way we are trying to find to stop a freefall in a free market in a free economy while it is very important to keep the markets free. That is the strength of our markets, the freedom. So as we move with controls, my question has to evolve around this element that you are presenting as the most basic means of controlling this free market so at the same time making sure it is still free to function in the beauty and the strength that it has. And your instrument for doing this apparently is the circuit breaker.

And the circuit breaker basically is a function of time increments. It is a function of pricing. And I wonder, how would you determine that? Who will determine that? Will it be an increment of 15 minutes if it goes down 5 percent, or would it be 2 or 3 hours if it goes down 10 or 20 percent? And will it apply across each exchange? We have seven of those operative. Or would it apply just to individual stocks? How simply would that circuit breaker work and allow still for the freedom of trading?

Ms. SCHAPIRO. Congressman, that is a great question. And I think it is important to note that we very much believe in the market and in the market mechanism, but I don't think anyone would argue that when the market went down 900 points in a very, very short period of time, and 500 points in a matter of a couple of minutes, that the real forces of supply and demand were operating. We clearly had a problem that was related to the fact, in my view, that we had markets operating under different sets of rules.

We also had some issues about liquidity leaving the marketplace. Certain types of orders exacerbated that. The use of something called stub quotes that allowed transactions to be executed at a penny contributed to that. But clearly, something didn't work unrelated to market forces that we normally applaud and think make our markets better.

The circuit breakers that we are talking about with the exchanges would be designed based on longtime experience in other markets around the world which already have circuit breakers on a stock-by-stock basis as well as the experience of, for example the New York Stock Exchange which already has the equivalent of a circuit breaker, which I am sure they will talk about in their testimony in the next panel. Bringing in collective experience of all those markets together with the ultimate approval of the SEC for any rules that would institute circuit breakers, I think gives us

some confidence that we will be able to get it right, and if we don't, we will have to revisit it and make adjustments.

On a marketwide circuit breaker, as we have in our markets today that applies across the equities options and futures markets, both the SEC and the CFTC would ultimately decide whether changes to those existing circuit breakers are appropriate.

Mr. SCOTT. Part of the problem is the lack of uniformity across the markets.

Ms. SCHAPIRO. Absolutely.

Mr. SCOTT. So who in your estimation would be the entity that would make that determination at the particular time that circuit breaker goes into effect?

Ms. SCHAPIRO. There are two ways to do it, and the way I favor, quite honestly, is the one that has people knowing every day when they walk in that the price of—if a stock moves—and these are just examples—5 percent in 5 minutes that the market for that stock will be shut at every place it trades for a period of 3 minutes or 5 minutes or whatever is appropriate. The certainty of knowing ahead of time, I think, is of enormous benefit to markets because they thrive on that kind of certainty about what the rules would do.

Another way to do it would be to allow a listing market, so if it is a New York Stock Exchange stock for the New York Stock Exchange, to be able to say that we are shutting down or we are going into slow mode or we are turning off the electronic systems for 1 minute in this stock and all other markets would have to follow if that doesn't provide all of the upfront certainty that we get from circuit breaker.

Mr. SCOTT. Let me just ask, since my time is up, would this circuit breaker also work for a dramatic rise in price of stock as well as a lowering?

Ms. SCHAPIRO. There seems to be less appetite, I will say, for circuit breakers on the upside.

Mr. SCOTT. And if you had your druthers, would we have one centralized entity for determining when the circuit breaker goes, or would you recommend that each of the major exchanges have their own individual and that reaction sets in for the others?

Ms. SCHAPIRO. I think there has to be a minimum circuit breaker that applies across every market that trades for whatever the stock is or we will have exactly the problem that we had on Thursday.

Mr. SCOTT. Okay. Thank you, Mr. Chairman.

Chairman KANJORSKI. The gentleman's time has expired.

The gentleman from Texas, Mr. Hensarling.

Mr. HENSARLING. Thank you, Mr. Chairman.

I have been here since the hearing was gaveled into order and noticing the title of our hearing, "What Happened and What is Next?", I don't think I have heard what has happened, but I have heard a lot of debate about what is next, and I somewhat question the wisdom of debating what is next when we don't know what happened. Perhaps I missed something, but I think—Chairman Schapiro, I believe I heard you say that you are working around the clock to find the cause, but you don't have an answer today; is that a fair paraphrase of what you said?

Ms. SCHAPIRO. That is fair.

Mr. HENSARLING. And that you will share the trigger as identified with the public when you identify the trigger?

Ms. SCHAPIRO. As we—trigger or triggers—

Mr. HENSARLING. Trigger or triggers.

Ms. SCHAPIRO. When we understand what the cause is, we will absolutely share it with the public.

Mr. HENSARLING. Okay. And Chairman Gensler, I think I heard you say something similar, that your people are diligently fact-finding at this point, but you are not prepared to announce a cause of—

Mr. GENSLER. I would say that I think that the four factors I mentioned contributed to the turbulent market—we are continuing to research to see if there is a fifth or a sixth (and so forth) factor but the four factors I mentioned, the turbulent environment that this—the market—if I can use the airplane analogy, there were a lot of signaling advices. When market participants start to see bad signaling, they start to sell. They start to lay off risk, if I can use an old market term.

Third, there were some active traders providing liquidity stepping back from the market. I think there will probably be others that we will find as we do more research. And we were saying in a down market, we need to hedge. We need to put on bona fide hedges.

Mr. HENSARLING. So is it fair to say then that certainly you have localized individual factors worthy of further research, but you still have yet to draw the conclusion as to the trigger for this incredible violent market volatility?

Mr. GENSLER. I think we will have staff report preliminary findings next week that will have more in them. However, there is a factor that I think we have definitely identified, which is across the securities markets that individual securities trading down to a penny a share, if I can swim outside my lane, as Chairman Schapiro said—really is not acceptable in the capital markets when they were tracking moments before at \$40. That is something—that cross-market pauses or circuit breakers is about.

Mr. HENSARLING. I certainly agree, Mr. Chairman. It seems like, to some extent, the hearing is concentrated less on perhaps what is the underlying cause and is kind of turning into a debate of high-frequency trading, its relative benefits or relative cost. I have in my hand an editorial that was written, Chairman Schapiro, by one of your predecessors, Arthur Levitt, that appeared in The Wall Street Journal about 8 or 9 months ago. In the editorial, he posits, “Due to the rise of high-frequency trading, investors, both large and small, enjoy a deeper pool of potential buyers and sellers and a wider variety of ways to execute trades.” He went on in this editorial to write, “Choice abounds and investors now enjoy faster, more reliable execution technology and lower execution fees than ever before. All of that contributes significantly to market liquidity, a critical measure of market health and something all investors value.”

Do you have a comment on your predecessor’s thoughts?

Ms. SCHAPIRO. I do think investors have a lot of choices today. I think that is generally a good thing. I do think that they benefit from narrower spreads and lower costs as a result of competition

in our marketplace. But I also don't think they benefit from the kind of conduct that happened on Thursday where, in part because of disparate rules across marketplaces, investor orders were treated very differently and we had the phenomenon of a stock at \$40 trade at a penny.

And so while we don't know all the causes of the volatility, we do know what some of the symptoms were, and we can go ahead and tackle those, I think, understanding that we want to be cautious, we want to be thoughtful. We don't want to harm what is good about our markets. But I also think we run the risk of losing investor confidence if we don't move forward to fix some of the things that we believe and the exchanges believe are problems.

Mr. HENSARLING. If I could, Chairman Schapiro, have you comment on another part of his editorial dealing with the suggested 25 basis points per trade tax on all trades. Chairman Levitt said, "Such a tax has been tried before from 1914 to 1966. There is a transfer tax set at .2 percent of stock trades. That expense was simply passed on to investors. A tax on such transactions would probably drive high-frequency traders and the liquidity they bring to foreign markets." I know you didn't want to get dragged into tax policy, but do you have an empirical observation on whether or not historically such taxes have been passed on to investors?

Ms. SCHAPIRO. I really don't know the answer to that. I assume most costs are passed on to investors one way or another.

Mr. HENSARLING. I agree. Thank you for your time.

I yield back, Mr. Chairman.

Chairman KANJORSKI. The gentleman's time has expired.

Now, we will hear from the gentlewoman from Illinois, Ms. Bean.

Ms. BEAN. Thank you, Mr. Chairman. And thank you, Chairmen Schapiro and Gensler, and Director Cook, for your testimony today.

In the Wall Street reforms that we have already passed in the House and are pending in the Senate, an amendment that I authored and was included will require evaluation by the oversight camp council, the systemic risk council, to evaluate—identify and evaluate potential threats to the stability of the financial system. It would also require that they establish plans and conduct exercises in the same way that the Department of Homeland Security and other agencies do to potentially avoid or respond to or contain emergencies that would happen. And then they will provide a report back to Congress on the results of what they have anticipated and what they have discovered.

My question to both the chairmen is, the functional regulators such as yourselves already have the authority to do those types of exercises and plan ahead for eventualities, however slight you think the probability. Can you share with me in terms of those types of exercises reports and plans what had been done prior to May 6th in each of your organizations? I will start with Chairman Schapiro.

Ms. SCHAPIRO. Sure. And I may ask Mr. Cook to jump in here, because we do something called an ARP, an automation review policy examination, of all of our regulated markets to test the quality of their systems, the security of their systems, the robustness and the resiliency of their systems and their backups, and that is a routine program we engage in regularly. We are also gathering data,

as I have said, probably 300 times here and everyone is tired of hearing, through our market structure concept release on issues that will relate in some part to systems and particularly the impact of strategies that are utilized by algorithmic traders and high-frequency traders on quality and the integrity of our markets.

Ms. BEAN. Chairman Gensler?

Mr. GENSLER. We are fortunate to be able to get the position data every day, so what we got last week was not unusual because under our statute, we are able to get the whole set every day. Every Friday, the five commissioners sit in a room and get a surveillance brief on the activities of that marketplace for that week. Then, we also look at over the next week as to how the futures market is coming together. So we do it on a real-time basis week to week in terms of our surveillance in the markets. In terms of last Thursday, if I might say, Secretary Geithner had us and the whole President's working group together—I think it was a 4:15 call.

I can't remember the evening call we had. The first thing Friday morning again, and maybe there was a second one Friday. I can't recall. So the President's working group may sort of mutate into this council in a sense. But, there was a very active cross-governmental collaboration Thursday evening, Friday, and over the week-end.

Ms. BEAN. Thank you. Director Cook, did you want to add anything further? No?

I guess my question would then be, moving forward, do you anticipate further rigorous planning, out-of-the-box thinking about potential scenarios that you may not have otherwise anticipated?

Ms. SCHAPIRO. Absolutely. And one of the reasons we proposed just a couple of weeks ago a large trader reporting system, which exists on the CFTC side—I recall it from my days there—on the equity side so that we can actually identify much more quickly the activity of high-frequency traders in the markets on a routine basis. And we are—the Commission will vote in about 2 weeks on the proposal to create a consolidated audit trail so that we can track from the inception of an order through execution and settlement every modification, every change, every hand that touches that order through our market processes. And we can then do these kinds of market reconstructions far more efficiently than we are able to do this one now, having to combine multiple audit trails from every one of our trading venues.

Ms. BEAN. I guess my question is audit trails are after the fact, but preemptively, will you be doing scenarios and anticipating if someone seeks to do harm in the market or to manipulate the market in some way for their own gain—are you anticipating those potential attempts and running through scenarios?

Ms. SCHAPIRO. I think we are doing that now, and certainly Thursday heightened our urgency about doing that. But I also think that having an audit trail and understanding the trading data better will enable us to think more creatively about what kind of scenarios we ought to be thinking about and worrying about.

Ms. BEAN. I have another question—go ahead.

Mr. GENSLER. I was just going to say that although we do similar things internally, we don't think that is enough. One of the reasons



we came together to form this joint advisory committee is really to have outside experts looking out over the horizon and saying what is the next emerging risk that we ought to be looking at.

Ms. BEAN. I see my time has expired. I will yield back.

Chairman KANJORSKI. Thank you. We will now hear from the second gentlelady from Illinois, Mrs. Biggert.

Mrs. BIGGERT. Last but not least. Thank you, Mr. Chairman.

Following up on that, I think that some of us might recall that we do have Chicago First, which is really a public-private partnership that was created in 2003 legislation, and this was following 9/11 that was a model for the rest of the country, and I think there are quite a few of these groups. Have you worked with them at all?

Ms. SCHAPIRO. I have not.

Mrs. BIGGERT. Maybe we can discuss that at some time later. But my next question was for Chairman Gensler and—

Mr. GENSLER. Actually, to answer your question, we have worked with them.

Mrs. BIGGERT. As you know, CME uses a number of risk management controls. Can you explain how CME was able to contain the contagion that originated in the equities markets? Specifically, can you explain how the stop price logic works?

Mr. GENSLER. There are a number of risk management controls in the futures markets. The stop price logic, which is one of four, works within their computerized trading platform called glowbacks. As the market goes down or up, if the orders in the book are going to be spreading so much that there will be a cascading of what is called stop-loss limit orders—that is a mouthful. But if there is a cascading that I believe goes more than 6½ points, then it will actually pause, give 5 seconds for more orders to come in.

That is what happened right at the bottom of the market at 2:45.28, there was a 5 second pause. As the market traded up three-quarters of a point and then as it did it sort of moved up.

Mrs. BIGGERT. So should a similar rule be applied to other markets, equities?

Mr. GENSLER. I think that Chairman Schapiro is talking—because there are different characteristics, but across the platforms to see whether there is something, I would say broadly similar though not identical.

Ms. SCHAPIRO. Broadly similar though not identical. We are looking at individual stocks having circuit breakers that would operate to stop trading for a period of time so that algorithms can be refreshed and additional liquidity can be attracted to the markets.

Mrs. BIGGERT. Next then, has the trading technology gotten ahead of the regulators? If the regulators aren't ahead of the technology, won't we have problems like last Thursday?

Mr. GENSLER. I am very proud of the group at the CFTC. I inherited most of them but it is a terrific group. But I do think that we have been underfunded on technology. We have a significant investment in front of us to do what we call automated surveillance and compliance. We are trying to build the flags and alerts to look at the hundreds of thousands of transactions a day by basically what is called simply exception reports and then flagging them for good people like Mr. Sharrits, who is sitting behind me, and his team.

Mrs. BIGGERT. Okay. Chairman Schapiro?

Ms. SCHAPIRO. We are significantly underfunded in technology. Until just this year, our discretionary technology budget for development projects was 50 percent below what it was in 2005 and our markets are vast and complex—

Mrs. BIGGERT. I know, and I have asked you this question before: How old is your technology? Is it 10 years, 20 years?

Ms. SCHAPIRO. I think it probably depends system by system. But Congress has been generous in the past year, we have been able to build some new technology to consolidate our tips and complaints and referrals more effectively, but we have some very old systems, some of which I recall from when I was a commissioner in the early 1990's.

Mrs. BIGGERT. And as you talked about your markets, I think it has been said that you are still aggregating data from 50-some electronic trading venues, and this really highlights the fragmented nature, doesn't it, of our markets? And while this fragmentation may be at least partially to blame for this Thursday's market drop, is it also hampering the SEC's search for explanations?

Ms. SCHAPIRO. It is making the job more complex. I will say I have been envious of Chairman Gensler's ability to download files from a single marketplace largely and conduct their analysis. We have to download voluminous files from multiple market participants—19½ billion shares of stock traded on May 6th in 66 million transactions. Once we are done analyzing that, we then need to compare our analyses with the CFTC so that we are sure we are linking the two markets together appropriately. So more technology would absolutely enable us to do this job a little bit faster.

Mrs. BIGGERT. Is there a plan and a timeline for implementation of updated technology?

Ms. SCHAPIRO. We still don't have the resources to do much of what we would like to do. The Commission will consider in the next couple of weeks a proposal to create a consolidated order audit trail that will give us vast amounts of data and make this kind of reconstruction far simpler than what we are going through right now. That will largely be developed by the markets and we will have full access to the data.

Chairman KANJORSKI. The gentlewoman's time has expired.

The gentleman from Massachusetts, Mr. Capuano.

Mr. CAPUANO. Thank you, Mr. Chairman. I want to thank the two chairmen and Mr. Cook for coming today.

I also didn't expect a whole lot of final answers today. I have faith that you will rip this apart for the next several weeks or more and come back with a more thorough response, and I think that is an appropriate thing.

I do want to focus on one thing I do think is within your purview, not so much for a conclusion as much as just questions, particularly Chairman Schapiro, the decision to cancel trades.

I have no problem with the concept. My concern is, where do you draw the line? As I understand it, give or take 300 entities, or whatever it may be, if you are going to cancel some, why not just cancel them all? Pick out the timeframe when people started to fall off the table, and just from that point forward, something went wrong. Because no matter where you draw the line, somebody is

going to get hurt and somebody is going to sue somebody. They are probably going to sue you, not me, so that is okay. But I just don't understand why you drew the line that you drew.

Ms. SCHAPIRO. We didn't draw the line, although let me agree with you that this was a highly unsatisfying process from my perspective. Under the rules of the exchanges, they draw the line about when to cancel erroneous trades, and they met right after the market closed on Thursday.

Mr. CAPUANO. "They," meaning who?

Ms. SCHAPIRO. The stock exchanges. And they came up with a common standard to cancel trades at prices that they think are sharply divergent from the previous day's close. They selected, and it would be great to ask them, I think at the next panel, 60 percent off the prior day's close, or the 2:40 trades, the last probably really solid trades in the market.

A lower threshold would have resulted in many, many, many more trades being canceled, which would have had some ripple effect in the markets in terms of traders who were hedged in other markets would have had this trade canceled, but their hedges are still standing.

But it is clear that it is not a process that I think works to the advantage of investors. So when we brought the exchanges to town on Monday, we asked them to think about how we can make a more certain and clear process so that investors know up front what trades might be broken and what trades might not be broken if we have another kind of event like we had on Thursday.

Mr. CAPUANO. Is this issue now settled? It is done? Going forward is one thing, but for this particular day, is that decision final in stone, not to be reviewed?

Ms. SCHAPIRO. I believe the exchanges will tell you that decision is final. I expect that there will be—

Mr. CAPUANO. I hope they have good lawyers.

Ms. SCHAPIRO. You may be right about that.

Mr. CAPUANO. Oh, no, I am right about that. I am a lawyer. I would sue you. Depending on what happened in my pension fund, I might be suing you. I don't know. I think it is ridiculous. I think it is inappropriate. I think it is arbitrary. Again, I am hoping to hear answers, and if not from you, I will ask the next panel. But 60 percent is some magic number and 59.9 isn't? That is ridiculous.

Ms. SCHAPIRO. Exactly. I share your concern, and we are going to fix this going forward.

Mr. CAPUANO. Mr. Gensler, I am not exactly sure whether you did the same thing.

Mr. GENSLER. There were no busted trades in the futures market. The rules in the futures markets are very tight, in terms of what is called a "busted trade," they have to occur within a certain number of minutes after the trade and there is a certain limit as to how many ticks away from any future that trades that could actually generate that. So, there are very prescribed rules.

Mr. CAPUANO. That is subject to a specific standing rule?

Mr. GENSLER. That is correct.

Mr. CAPUANO. I may argue with what the rule might be, but at least everybody who gets into it knows what the rules are.

Mr. GENSLER. It is very transparent.

Mr. CAPUANO. I think the problem with the other exchanges is the lack of transparency and arbitrariness. I think we have enough problems with this. Generating hundreds of thousands of lawsuits on the basis of probably billions or tens of billions of dollars doesn't help the situation. But I will ask the next panel.

Thank you, Mr. Chairman. I yield back the remainder of my time.

Chairman KANJORSKI. Thank you.

Now, we will hear from the gentleman from California, Mr. Campbell.

Mr. CAMPBELL. Thank you to all three chairmen and Director Cook.

I am trying to understand what we know and what we don't know at this point. So, Chairman Schapiro and Chairman Gensler, jump in at any point if you want, but just sort of rapid-fire questions.

If we focus on these well-publicized trades, the penny, the Accentures and so forth, and P&G, which didn't go to a penny but went down; those trades, those trades occurred and were consummated, correct, at the time? So someone bought and sold those stocks at a penny.

Ms. SCHAPIRO. Yes.

Mr. CAMPBELL. What sort of volume transacted at that level? Do we know that?

Ms. SCHAPIRO. I don't know that. I would be happy to provide it for the record. I know that there were about 300 stocks where trades were broken because they were 60 percent or more away from the market, and I believe the last number I was told was about 19,000 trades.

Mr. CAMPBELL. Nineteen thousand trades across all those securities at significant volume. So in a given security, were there 1,000 shares traded at a penny, or were there 300,000 shares traded at a penny, or do we know?

Ms. SCHAPIRO. I would be happy to provide that for the record. I don't know that we have all that data yet.

Mr. CAMPBELL. Okay. Where were these trades transacted? The New York Stock Exchange, NASDAQ, other exchanges?

Ms. SCHAPIRO. At many places. And that is the nature of our very fragmented and dispersed marketplace. NASDAQ. No stock exchange trades basically more than 20 percent of the volume or 25 percent of the volume in its own listed securities because we have so many trading venues. So they traded in markets like NASDAQ, the New York Stock Exchange, the ECNs, like Direct Edge and BATS, and in dark pools where they are not so transparent, and through internalization by broker-dealers. So there are multiple ways for a securities transaction to be executed.

Mr. CAMPBELL. So again, if we take a given security that traded at a penny, those transactions occurred on multiple exchanges at a penny at that point; or do we know?

Ms. SCHAPIRO. We don't know.

Mr. CAMPBELL. That is part of what we don't know?

Ms. SCHAPIRO. Of what we are working on.

Mr. CAMPBELL. Okay. I suspect a lot of this is what we don't know. And what I think we need to find out before we can, you

know—you can or we can jump to any conclusions about where this should go.

I understand we have stop-loss orders and those turn into market orders. But then how does it run through—if that happens at \$30, how does it run through everything to a penny? How did that occur? I understand at that point it is a market order and if the market is a penny, the market is a penny. But somehow, it has to run from \$30 to a penny.

Were there significant transactions all the way down the line, or did we have a 20-point gap?

Ms. SCHAPIRO. In some cases, there were, and in some cases, there weren't. As the orders started to cascade down, there were not buy orders on the books of these multiple venues that could soak up that selling activity, and as there was continued pressure from the sellers, nervous investors who put in stop-loss orders that convert basically into a market sell order as they go down, the sellers that were remaining in the market ended up executing against what we call stub quotes, and that is where you get the penny price.

A market maker does not want to stand there and provide liquidity. They have to make a two-sided market. They will make a one-cent to a \$100 market, so that one-cent price is out there in the marketplace, and some of these orders hit that.

Stub quotes—I think the view of the exchanges, as we discussed yesterday, was universally that they serve no purpose in our marketplace. So that is another issue that we have on our immediate agenda, to consider whether we either have to have real market-maker obligations to make genuine competitive markets, tight spreads, or we get rid of the obligation to have two-sided quotes, so we don't end up with these penny quotes.

Mr. GENSLER. And if I could say, there is a difference in rules in futures and securities, but I am not sure you could translate one to another. There are no stop-loss market orders in the futures market on both of the major exchanges. It is a stop-loss limit order, meaning when the stop is hit. A stop is when the price goes down and it hits a price and then the order goes in; it has to have a limit to it.

Mr. CAMPBELL. Let me just ask one more question, then, before my time runs out, which is what has changed—this could not have happened, I suspect, 15 years ago or 20 years ago or 25 years ago or 40 years ago, particularly if you go back to traders on the floor with a piece of paper 40 or 50 years ago and so forth. But I guess what has changed that enabled that kind of significant—because stop-loss orders turning to market orders are not a new thing. This has been around for a long time. What is the new thing that occurred that caused this?

Mr. GENSLER. I think that volatility is part of markets and huge volatility was in 1987. I think the change is the floor traders, the specialists, or the pit traders in futures, are now more and more in some office with computers, and the computers are located right next to the exchange engines—that is called co-location—and everything is down to nanoseconds, rather than those liquidity providers used to be either a floor specialist or in the pit. That is one thing that has changed in the 20-some years.

Ms. SCHAPIRO. I would say that while we did have tremendous volatility in October of 1987, we had many more market participants who don't have the same sort of affirmative obligations to the marketplace that we had at that time with specialists, with market-makers on the NASDAQ stock market. So speed, volume, velocity of trading, volatility, and lesser obligations to the market as a whole.

Mr. CAMPBELL. My time has expired. Thank you.

Chairman KANJORSKI. Thank you very much.

Now, we will hear from the gentleman from Illinois, Mr. Foster.

Mr. FOSTER. Thank you, Mr. Chairman.

Does anyone yet understand the origin of the tremendously high share prices that were bid, at least reported, \$100,000 for Sotheby's and so on? Were these algorithmic bids, or what was the nature of them and what was the nature of the firms that made them?

Ms. SCHAPIRO. I believe we are still looking at that, and I will ask Robert to jump in here. Interestingly, there were 20 stocks that traded at 90 percent above their 2 p.m. price during that period when there were 250 or more stocks that traded at 90 percent below their 2 p.m. price. But I don't know if we know yet the reason.

Mr. COOK. No, we don't. There are many more that traded below their 2 p.m. price than above, but we don't yet know the nature of the orders that came in that fed into those prices above.

Mr. FOSTER. So you don't even know who made them?

Mr. COOK. Not at this time. That is part of the information we are gathering together, because we are pulling together the information as to where the orders originated, at which trading venue, and then we will go back further and find out who put them in through the brokers.

Mr. FOSTER. So this many days later, you don't know who it was that made these funny-sounding bids.

Chairman Gensler, would that be the case with you?

Mr. GENSLER. No. In the futures market, we didn't have either, because there are so many curbs and limits in this risk management. One of the things that high-frequency or algorithmic traders do is called "sniping," if I may use the term, in which the computers actually put in a bid, one contract or one security at a time, and try to pull out the liquidity and find it. If there was a resting order, a resting bid at a penny or a resting bid at \$100,000, the computers can strip through and maybe find it. That may be a possible thing to look at it—it may have been what happened.

Mr. FOSTER. Are there mandates that automated trading firms appropriately version and archive their algorithmic code and their databases so they can reproduce their trading decisions after the fact in the course of these investigations?

Mr. GENSLER. We have actually asked for some of these largest traders to actually sit down and see their code. Our folks in our Division of Market Surveillance are sitting down this week with a number of the largest ones and are actually looking at their codes.

Mr. FOSTER. Right. But it is a possible response that they say, "We just don't know. We had some version, but then we overrode it."

Are there enforced industry standards so that you can actually go back and say what version of what code were you running last Wednesday afternoon?

Ms. SCHAPIRO. If they are regulated entities, yes, we can see their code and they need to freeze their code if asked. And we have told specific firms post-Thursday that we want the code frozen so it is not changed. If they are not regulated entities, we have to get that information by a subpoena.

Mr. FOSTER. Could you explain briefly how trade busting works on synthetic positions? If the underlying stock is determined to be broken, does that automatically imply the breaking of various synthetic positions? How does that work? Is there an agreed-upon way that should happen, and is that the way it happens?

Ms. SCHAPIRO. I can speak to how the securities trades are busted. And as I think we have talked about, it is a pretty unsatisfying process because it lacks real clarity and consistency for the investors up front. But the exchanges in this situation—and this is unusual, because your normal trade bust situation is a single stock—something goes wrong in the technology and you need to bust a lot of trades in one stock. Here we had hundreds of stocks where trades needed to be busted because prices were sharply divergent from where they had been on the previous day's close. Exchanges meet. They come up with a common standard so that they are all busting trades at the same level.

Mr. FOSTER. My question was: How does that percolate back into positions that are derivative positions on equities?

Ms. SCHAPIRO. In terms of busting, I don't believe it does. But it does have an impact on them. If they have hedged a position that is then busted, they have a hedge, they are now exposed.

Mr. COOK. To follow up on your question, in the securities markets, the options markets would make the decision of whether to break the trade if the underlying security trade had been broken. In this case, I believe very few options trades were broken, but some were.

Again, the process was not fully coordinated in the sense that the options markets made that decision separately from the securities markets, and that is one of the things we are looking at going forward.

Mr. GENSLER. Though I don't remember everything in CME Rule 5(8)(a), which is their busting rule, what we had last Thursday, the indices themselves, S&P and Dow, didn't reprice their indices. They didn't come back and say there was a different thing, and I know that was relevant to those markets.

Mr. FOSTER. Okay. Would you say that overall what happened last Thursday strengthens or weakens the case for merging the CFTC and the SEC? First off, you all know my position that they should be merged and moved to Chicago.

Ms. SCHAPIRO. Okay, I am with you on half of that. I have long held the view that the two agencies should be merged; that the participants in these markets, the products are increasingly similar and the markets are increasingly linked, and there would be efficiency and economy of scale to a merger. But if the political will for that to happen doesn't exist, I think—as I said earlier, this is the best working relationship in my many years of being around

these two agencies I have ever seen in terms of collaboration and cooperation—I am not sure that the event of Thursday would have played out differently had there been just one agency.

Mr. FOSTER. Do you share the development of software tools that you are both frantically developing to analyze this, or do you have independent groups? Do you have any comments?

Ms. SCHAPIRO. I will tell you, it took an act of Congress to allow us to create a joint advisory committee. So the ability of Federal agencies to actually share things mystifies me in its limitations.

Mr. GENSLER. We actually want to thank you. You didn't know you were voting on it at the time, but it was part of the appropriations bill last year. Congressman Lucas probably did know about it. I think that our two agencies, and I thank Chairman Schapiro for her support the last 11 or 12 months I have been in this job, have been very collaborative, and very close. I think the will of Congress has been, since the 1930's really, a strong agency in the SEC overseeing its orbit, another agency overseeing the exchange derivatives markets, and now we are trying to fill this gap in the over-the-counter derivatives market as well.

Mr. FOSTER. I yield back.

Chairman KANJORSKI. Thank you very much, Mr. Foster.

That completes our questioning for this panel. I will just take a moment before we excuse you, I want to thank both of you again and I want to reiterate something that Mr. Scott said in his questioning. After hearing the testimony from our two regulators, I feel a lot more secure. I am not certain I could tell you why, but I feel a lot more secure. I look forward over the next several weeks to open disclosure with the American public and the Congress as to what you find, as soon as you find it, so that we can get to a final conclusion, but in the meantime, to participate in such rules or changes that can help prevent what has happened last Thursday.

With that, I thank you both very much. We are going to allow you to leave so you will be able to enjoy the rest of the day.

Our second panel, first of all, I thank you for appearing before the subcommittee today. Without objection, your written statements will be made a part of the record. You will each be recognized for a 5-minute summary of your testimony.

First of all, we have Mr. Larry Leibowitz, chief operating officer, NYSE Euronext.

Mr. Leibowitz?

#### **STATEMENT OF LARRY LEIBOWITZ, CHIEF OPERATING OFFICER, NYSE EURONEXT**

Mr. LEIBOWITZ. Good afternoon. Chairman Kanjorski, Ranking Member Garrett, and members of the subcommittee, my name is Larry Leibowitz. I am the chief operating officer of NYSE Euronext. Thank you for the opportunity to be here today.

We commend the subcommittee for your rapid response to the events of last Thursday. As you know, we have begun a dialogue with our regulators and our other trading venues, and it has been very productive. We are committed to working with you and other market participants to restore confidence and enhance investor safeguards in the future.



Today, I would like to discuss three things: first, the high-level causes of the events last Thursday; second, clarifications about NYSE's market model and how it worked; and third, our recommendations going forward.

It is understandable that everyone is looking for a smoking gun behind last Thursday's dip. However, the circumstances are more complicated than that. I will leave it to the regulators we just heard from to link the interactions of various markets, but from our standpoint, we see no evidence of the "fat finger" error or market manipulation. But we also note that more and more our markets within the United States, and indeed within the world, are intertwined.

However, we do see the following: elevated market activity coming from adverse European news, including a huge and a broadly-based wave of orders and quotes at around 2:30 p.m.; a significant reduction in market liquidity as measured by the size of order books through the day which accelerated dramatically through the downturn; and various microstructure issues that resulted in certain marketplaces not interacting with one another which exacerbated the liquidity effect.

The NYSE has embraced electronic trading, and we believe our market model provides the best combination of cutting-edge technology with human judgment. The NYSE hybrid market rules expressly provide mechanisms to mitigate volatility and large price swings, which we always have believed is a critical piece of our offering to listed companies and their investors.

Specifically, the NYSE incorporates in our trading structure a type of circuit breaker mechanism known as liquidity replenishment points, or LRPs, which temporarily and automatically pause trading in stocks when significant price movement occurs. On a typical day, LRPs are triggered 100 to 200 times, lasting for seconds at most, and, during the recent financial crisis, served the market well.

Let me be clear: The LRP mechanism does not halt trading. Instead, for a short time, trading is automatically paused to facilitate more accurate price discovery and prevent the market from a sudden and significant move. During this pause, our quote is visible to other market participants and new orders are accepted. To jump on Chairman Gensler's analogy, our LRPs are analogous to taking the controls of a plane off autopilot during turbulence.

I want to highlight a few specifics and clarify some anecdotal statements that have been made. This is not meant as a comment on other markets or other market models, just to clarify from the NYSE standpoint what we saw.

During the 2:30 to 3:00 period, market share on NYSE was 5 percentage points higher than usual during that time of day. Participation rate of our designated market-makers, formally known as specialists, was equally strong. This was evidence that our liquidity providers did not walk away from the market as we actively traded during the downturn. Furthermore, to demonstrate that LRPs protected orders in our market, stocks listed on other markets had price declines and erroneous executions far greater than on NYSE-listed stocks.

Lastly, the overall marketplace needed to cancel approximately 15,000 executions after Thursday's decline. On NYSE, even though we handled the largest share of orders in the marketplace, we had to cancel zero trades because of the protective measures in our market.

One note: LRPs are not intended to prevent the market from falling. Rather, our LRPs are designed to protect the integrity of our market by preventing a panic-led downdraft and mitigating systemic risk. Yet when we are in a slow mode, other electronic markets may choose to ignore our quotes as permitted under regulation NMS.

The bottom line is that while there is always room to improve LRPs and other such mechanisms, these actually worked reasonably well on Thursday. However, the mechanism is only truly effective if observed by other trading venues, and that is why Chairman Schapiro's plan for an industry-wide trading circuit breaker is needed.

In terms of recommendations, I want to focus on three main topics, echoing much of what Chairman Schapiro stated earlier.

First, our markets need a preestablished and coordinated way to respond to extreme rapid volatility. The LRP system has worked, but marketwide circuit breakers are necessary and will be even more effective. The listing and trading venues have agreed to develop these stock-level circuit breakers to pause trading when the price of a security has changed dramatically in a short period. Once circuit breakers have been triggered in a security, they will apply to all trading in the security, wherever it takes place.

Second, the current marketwide circuit breakers were established long ago and are based on market moves of 10 percent, 20 percent, and 30 percent. There has not been a move greater than 10 percent in a single day post-2000. These levels will be tightened and the circuit breaker will be based on a broader index, rather than a narrow Dow Jones index.

Third, the rules on cancellation of trades will be further defined. On May 6th, it was announced, after markets closed, that any trades executed at 60 percent above or below the last price at 2:40 would be canceled. This action was not predictable and caused confusion in the markets. We are working with regulators and other exchanges to establish clear cancellation rules for the future, though circuit breakers will help mitigate this problem substantially.

To facilitate a review of extraordinary trading events, there should be a consolidated audit trail that will allow regulators to easily review marketwide trade data. We understand the SEC is developing such a proposal and we are committed to assisting in that effort.

Ultimately, these and other important actions may best be achieved by consolidating market surveillance in one securities regulator, probably FINRA, which will require an act of Congress. We also at the same time need to ensure that both FINRA and the SEC have the full funding required to perform these duties.

Finally, the SEC should continue its broad-based market review to help find ways to improve our current market structure.

In closing, we applaud the SEC and the CFTC for working together to review the events of May 6th and to develop a coordinated response. We at NYSE Euronext are committed to maintaining our ongoing productive dialogue with these agencies and other trading venues.

Once again, thank you for the opportunity to appear, and later on I will be happy to answer any questions you may have.

[The prepared statement of Mr. Leibowitz can be found on page 95 of the appendix.]

Chairman KANJORSKI. Thank you, Mr. Leibowitz.

Now, we will hear from Mr. Eric Noll, executive vice president, NASDAQ Transaction Services.

**STATEMENT OF ERIC NOLL, EXECUTIVE VICE PRESIDENT,  
NASDAQ OMX GROUP, INC.**

Mr. NOLL. Good afternoon, Chairman Kanjorski, Ranking Member Garrett, and members of the subcommittee. Thank you for letting me speak to you today.

We met yesterday, along with our fellow exchanges, with Chairman Schapiro to develop a strategy to combat market instability and protect investors in the wake of last Thursday. We will act jointly to assess and implement changes to enhance the market's ability to handle unusual trading events in the future.

Our markets are strong despite the 17 minutes of unusual trading that occurred on May 6th. In fact, the market's rapid recovery during the day confirms their resilience under extraordinary strength.

To fully understand May 6th, you have to look at the state of the markets heading into last week. Markets were nervous and operating during an unusually long upward trend. From a market low of below 1300 March 2009, the NASDAQ composite index had risen steadily to 2535 on April 26, 2010.

Chairman KANJORSKI. Mr. Noll, could you see if your microphone is on or whether it is close enough to you?

Mr. NOLL. Sorry.

Markets were also becoming increasingly volatile, according to the CBOE Volatility Index, which measures volatility of the S&P 500 expected over the next 30 days. Note that the VIX is normally below 20, and by May 5th, the VIX reached the upper 20's, and on May 6th and 7th, it closed above 30, and it did in fact trade above 40 on several occasions during that period of time.

This increased volatility is tied to the escalating financial crisis in Greece and Europe. While percolating for several months, the potential harm seemed to sink into the U.S. markets last week.

Against this backdrop, we arrive at the afternoon of May 6th. First, the Dow Jones Industrial Average was already trading off 272 points for the day and 500 points in the last 3 days. Second, the Chicago Mercantile Exchange was beginning to experience unusual trading activity in the E-Mini Junes at the same time as equities handled heavy trading in the highly correlated equities to that E-Mini future.

E-Mini volumes rose and prices began sinking rapidly at 2:42, just before equity prices sank rapidly as well. At 2:45:30, the E-Mini trading became so volatile that the CME triggered an auto-

matic 5-second trading pause in the E-Mini futures. The price of the E-Mini future immediately leveled off and began to climb rapidly. Equities followed shortly thereafter.

Third, the NYSE Arc Exchange began experiencing data communication issues that hindered the electronic linkages between it and other exchanges. Simultaneously, the New York Stock Exchange began reporting multiple liquidity replenishment points, or LRPs, and gap quotes that impacted the trading of individual stocks in the New York exchange market.

From 2:39 to 2:47, the Dow dropped 723 points to 9800.69, its low for the day, and down 995 points total from the prior close. From 2:47 to 2:56, the Dow recovered just as rapidly, rising 612 points, from 9862 to 9974, down 387 points for the day. From 2:56 to the close, the Dow rose another 45 points, ending the day down 324 points.

NASDAQ's preliminary analysis indicates the unusual trading activity on May 6th was triggered by a confluence of unusual events, including events outside the cash equities markets. NASDAQ continues to investigate Thursday's events, but at present has located no smoking gun that single-handedly caused or explained Thursday's events.

From a systems standpoint, NASDAQ's market operated continuously during the day and the critical 17 minutes. Each and every one of NASDAQ's electronic systems functioned as designed and as intended: our execution engine, our market data feeds, and our surveillance systems.

We have detected no system malfunction or errant trade by a NASDAQ member interacting with the NASDAQ stock market. No NASDAQ member has identified a system error or aberration within their own systems.

As stated, NASDAQ supports the response of the SEC. We support the recommendation to update market circuit breakers. We think a circuit breaker should automatically halt trading in all stocks and in all markets in measured stages. We would expect that Chairman Schapiro, based on her testimony, will have some announcements about what those finally will look like in the very near future.

We also support the Commission's desire to explore cross-market single-stock trading halts. The important characteristics of such a halt should be consistency across all the markets, initiation by the primary market, and an orderly resumption of trading by the primary market. Any rule should recognize that stocks trade in different ways rather than a one-size-fits-all approach.

We do believe, however, that trading halts and other regulator actions should never be a tool used by a primary market or any other marketplace for any competitive reason or to disadvantage any other national market system participant.

Finally, we are exploring other ideas that will improve and encourage high-quality and continuous quoting on all markets.

Thank you again for the opportunity to share our views. I am happy to respond to any questions you may have.

[The prepared statement of Mr. Noll can be found on page 106 of the appendix.]

Chairman KANJORSKI. Thank you very much, Mr. Noll.

Now, I recognize the gentlelady from Illinois, Mrs. Biggert, to introduce our next witness.

Mrs. BIGGERT. Thank you, Mr. Chairman. I would like to welcome my constituent, Mr. Terrence Duffy, and thank him for joining us today. Mr. Duffy is the executive chairman of the CME Group, and I thank him for joining us and sharing his expertise.

**STATEMENT OF TERRENCE A. DUFFY, EXECUTIVE CHAIRMAN,  
CME GROUP INC.**

Mr. DUFFY. Thank you, Congresswoman Biggert. Chairman Kanjorski, Ranking Member Garrett, and members of the subcommittee, I am Terry Duffy, executive chairman of the CME Group, and I want to thank you for allowing me to testify today.

It is widely known that futures markets are the leading indicators for cash markets. Our reviews of the market's activity revealed no suspicious or erroneous activity by our customers. The exchange did not bust or reprice any transactions. Further, our analysis indicates that the decline in the SPDR ETFs and 3M stock preceded the drop in the S&P 500 contract. As I will show you in a moment, they were far more severe, even after substantial price recovery in the S&P 500 futures contract. Liquidity in the S&P futures and its effective spreads were considerably better than the SPDR ETFs throughout the day on Thursday.

At this point, it is premature to draw any definitive conclusions as to what caused the extreme market volatility on May 6th. What we do know is that there were a number of macroeconomic conditions, as well as lack of operational harmonization across the multiple trading venues of the equity markets. This resulted in the cancellation or busting of securities transactions by the NASDAQ stock market and NYSE Arca. In contrast, CME Group's E-Mini S&P 500 futures contract performed smoothly despite significant market activity and volatility.

The selloff and subsequent rebound in the E-Mini S&P 500 Index futures, while dramatic, was very orderly. Our markets provided the liquidity investors needed to hedge against the turmoil happening elsewhere.

As I mentioned earlier, CME Group's E-Mini S&P 500 is a leading indicator, not a cause, of the decline in the underlying primary market. Futures contracts, by design, provide an indication of the market's view of the value of the underlying stock index. This makes index futures a valuable risk-management tool for market participants.

To illustrate this point, I would like to draw your attention to these charts. When looking at this information, it is important to note there is a difference between futures and cash reporting. Cash index values are only updated every 15 seconds, while futures prices are updated on a real-time basis. This means the futures market reflects conditions in real time, while the cash market has a 15-second delay.

The first chart shows the comparative value of the E-Mini traded on the futures market versus the equities markets. It illustrates that the E-Mini S&P, which is the blue line, moved virtually in tandem with the SPDR ETF market as well as the S&P 500 Index, which is the red line.

You can see at 13:46 p.m., the market had had time to attract liquidity and rebalance, and the E-Mini led the recovery, leading the Dow Jones to recover 400 points in 3 minutes.

Moving to chart 2, this graph shows price movement in the E-Mini S&P futures as well as 3M stock. As you can see, the price of 3M stock declined much more rapidly, starting at 13:45 while the E-Mini S&P 500 was hitting a low at 13:45 and 50 seconds, at which time you can see the market and the E-Mini reverses, while the 3M stock continues to decline.

Market integrity is of the utmost importance to CME Group. We have developed systems that maintain integrity in all our markets, including a number of controls to protect market users.

For example, CME is the only exchange in the world that requires pre-execution credit controls. As Chairman Gensler mentioned, CME Globex maintains functionality that causes the match engine to pause when orders, if they were executed, would exceed predetermined levels. Following the 5-second pause, new orders would come into the market. This is a critical point.

We believe this functionality and these protocols do not exist in the cash market. If they did, it would have been highly effective in eliminating price dislocations in 3M and Procter & Gamble. Furthermore, CME Globex electronic trading infrastructure incorporates numerous risk protection tools. They provide added safeguards to customers and clearing firms, including stop price logic functionality, price banding and circuit breakers.

As I mentioned earlier, stop price logic functionality helps to mitigate market spikes that can occur because of the continuous triggering or the election of trading of stop orders. This is what happened last week with the E-Mini and S&P futures, allowing liquidity to come into the market and ultimately leading to the rally in the equities market.

We believe the focus of your review should be on the national market system. We support Chairman Schapiro's recommendation regarding harmonization across these platforms. We have seen no evidence that high-frequency or other specific trading practices in any way magnified the decline on May 6th. In fact, we believe that high-frequency traders in our market provided liquidity on both sides of the market on this extraordinary day.

We do, however, recognize that changes should be considered to avoid a repeat of the events of May 6th. We would make the following recommendations.

As Chairman Schapiro pointed out, circuit breakers, including circuit breakers for individual stocks, such as those implemented by the NYSE, must be harmonized across markets.

We also believe that stop logic functionality should be adopted across markets on a product-by-product basis to prevent cascading downward market movements. The circuit breaker levels of 10, 20, and 30 percent and the duration of the halt and time of day at which triggers are applicable should be reevaluated in light of current market conditions to determine whether any changes are warranted. Any such changes must be implemented across all market venues.

I thank the committee for the opportunity to share CME's views, and I look forward to answering your questions.

[The prepared statement of Mr. Duffy can be found on page 70 of the appendix.]

Chairman KANJORSKI. Thank you very much, Mr. Duffy.

Now, we will move on to questions. I will take my question period first.

Mr. Noll and Mr. Leibowitz, listening to your testimony, I am not sure anything happened on Thursday. Everything worked. Is that correct?

Mr. LEIBOWITZ. Oh, I don't think any of us would say that everything worked. I think, in fact, what Mr. Noll was saying was his systems worked. But I think we would all agree that the market did not.

Chairman KANJORSKI. What caused the market not to work?

Mr. LEIBOWITZ. I think what both of us have found is liquidity fled the market through the day as the market was skittish, and then an overwhelming wave of orders came in on the sell side that built on itself. I think having a marketwide circuit breaker in effect would have helped mitigate that problem. But in effect, the market was illiquid just at the wrong time as sellers broke into the market.

Eric?

Mr. NOLL. Thank you, Larry.

Mr. Chairman, I think there are two things to observe that happened. I would agree with Mr. Leibowitz that in fact the markets did not behave normally on that day. I think my point was really our technology behaved as it was designed to behave that day.

I think it is important to observe two things. One is that the marketwide circuit breakers we do in fact have in place today were not triggered, because the market did not fall to the point where they were triggered and therefore cause a marketwide halt. So I think Chairman Schapiro is correct when she says that we should in fact revisit those and reinstitute different types of marketwide circuit breakers that will arrest those marketwide halts as they happen.

I think the other point that she made vividly today, which we certainly agree with at NASDAQ, is that we do need a coordinated stock-by-stock circuit breaker across all the markets, which we don't currently have on our books and we don't have the authority to implement. So I think we will see that soon coming out of the SEC.

Chairman KANJORSKI. There was no problem on your part on either of the two exchanges with the fact that the New York exchange did a slowdown operation, but NASDAQ continued going right on and allowed the sales to pass through to the NASDAQ exchange. That had no effect; is that correct?

Mr. NOLL. I think we would say that was a contributing cause to a confluence of events here. It points to what we would argue, the need for a coordinated stock-by-stock circuit breaker.

Mr. LEIBOWITZ. From our standpoint, I think what we have shown or what we see is we don't think the fact we were moving slowly exacerbated the effect. In fact, the fact that we were trading high-market share, keeping the stock prices in line, might actually have helped, and the fact that other markets that didn't have circuit breakers at all, like the NASDAQ listed market, had even

more damage than in the New York listed market. But I think we can all agree that having uniform marketwide circuit breakers would have helped in all events.

Chairman KANJORSKI. I have a question there. Everybody wants to protect the private market and have the market function. But is this the first time you have made that observation, either of the two major markets, that one set of rules was in place in the New York Stock Exchange and another set of rules in NASDAQ, and that you were not coordinated to operate in tandem together, so that this could happen—or you did not realize this could happen?

Mr. NOLL. I think what is fair, Mr. Chairman, is our markets are very coordinated in many ways. We have very similar corporate governance standards for our listed companies. As an example, not having to do specifically with trading, but for marketwide declines, overall market circuit breakers, we are coordinated. We have open “meet me” lines that we use frequently during trading problems and technology problems.

Chairman KANJORSKI. Mr. Noll, do not give me everything you are coordinated on. We do not want to know that. We want to know why this abnegation occurred.

Mr. NOLL. I am suggesting that we speak often about many issues. The one issue that had never appeared yet as a significant problem between our two markets is the coordination of a stock-by-stock circuit breaker.

Chairman KANJORSKI. What you are saying is because it never occurred, you did not simulate the possibility that it could occur, and you did not cooperate together to put in place common rules that would have prevented it from occurring; is that correct?

What I am trying to drive at here is obviously two free-market operations relying on either the United States Congress or the regulators to take care of the problem rather than doing it yourselves.

Mr. LEIBOWITZ. So as permitted by SEC regulations, we do have different trading models. We rely on designated market-makers who have an obligation to the market. They have a different type of trading markets. So there are various areas where our rules are slightly different.

We have seen times during the crisis in the fourth quarter of 2008 where there was significant breakage of trades in the electronics markets, erroneous trades, that there were not in the NYSE-traded market. At the time, no one felt that the separate rules exacerbated the problem. It is just there were more breaks in the electronic markets. There were tens of thousands of trades taken off the tape in the fourth quarter of 2008.

Chairman KANJORSKI. My time has expired. The gentleman from New Jersey, Mr. Garrett.

Mr. GARRETT. And as is often the case, I will follow up where the chairman was perhaps going on that.

So is this something, from what you are saying, is this a situation then, thinking back if you had this hearing awhile ago, that we just could not have seen coming?

Mr. NOLL. I think it is hard to say that we could have seen this coming. So we have a set of rules in place called Regena MES which governs the respect of different markets, and when they are quoting and when they are not quoting, and a whole set of proce-



dures around that, that we believe have worked very well up until to this point. I do believe they continue to work very well. As a matter of fact, Mr. Leibowitz operates an electronic market on NYSE Arca well that participates in Regena MES as well as the New York floor. They were engaged in the same electronic trading we were on Thursday and participating with us. So generally I think that rule set works extraordinarily well.

We did hit a confluence of events where clearly we need to do something to address—and I think what Chairman Schapiro suggests, which we agree with fully, is that we need that coordinated stock-by-stock circuit breaker.

Mr. GARRETT. And just to go down that road a little bit, Mr. Leibowitz, maybe you were touching on it, if I was hearing you as you were saying it, as far as those issues that are out there, the confluence of issues, was one of those issues that were in the confluence what was going on over in Europe and the fact of the whole Greek situation?

And, Mr. Noll, I think you said the United States was finally paying attention to that. Was part of that the fact that the value of the Euro currency was going down, other foreign currencies in relationship were going up, and the banks were having a difficult time with their carry trade in that respect, and so in order to deal with that, they had to do something, which I guess is to unload equities? Was that an element of what was coming out of Europe at that period of time?

Mr. LEIBOWITZ. I don't think we have any visibility into that, and we haven't heard that. I think we are really focusing on our market and leaving the SEC and CFTC to see the cross-market effects.

Mr. GARRETT. Does anybody else have a thought on that, as far as what the influence of that, as being one of the confluences of their impact to their trades as well?

Mr. NOLL. We have seen no evidence of that, and as Larry said, we are very focused on what happened in our individual markets.

Mr. GARRETT. To the extent you are focused on what is happening in individual markets, the chairman was saying before that here, 4 days later, we are still trying to get all the data collected from all the 40 or 50, however many there are right now, data sources. There is no central repository for all those trades, and that is why she is going out to get them, as she is, I guess. Is that a problem? Is that something that we should have seen in the past and tried to address?

Mr. NOLL. I think the chairman and I think other people in the marketplace have recognized that was a potential problem before. As a matter of fact, there have been ongoing discussions with FINRA and the SEC and all the markets about a consolidated audit trail that predates the May 6th event. It is unfortunate that we have not gotten to that point so far in the marketplace.

Mr. GARRETT. Is there something that holds that up? Is there somebody opposed to that?

Mr. NOLL. As far as I know, no one is opposed to that. I think it is a matter of applying the process and getting it done.

Mr. GARRETT. Who is responsible for that?

Mr. NOLL. Again, it is a marketwide issue among multiple regulators. I think there may even be, I am not absolutely positive

about this, but I think there may be some congressional authority needed for the SEC in order to do so.

Mr. GARRETT. To do something like that. To the point as far as what authority the SEC has now and what they may need in the future, one of the points has already been addressed, and you raised this to some extent as far as the commonality of the market callers that potentially bid on there.

Is there a difference as far as the folks who are at the table right now, the major participants in it, and some of the smaller alternative platforms, as far as whether this should be uniform across them all? And if the answer is no, why shouldn't it be? And if the answer is yes, would that impact upon the slightly different models that some of the smaller market participants would have?

Mr. LEIBOWITZ. The answer is there should be one standard across all platforms, whether it is an exchange, an ETS, an ECN, any different venue. And there will be.

Mr. GARRETT. And if we didn't have any of them here, but if they were sitting here, what would their argument be why that should be the case?

Mr. NOLL. I don't believe anyone would argue against a stock-by-stock circuit breaker at this point.

Mr. LEIBOWITZ. I think you have already seen CESMA and various other bodies come out in favor of it. I think that the industry at this point would line up 100 percent behind it.

Mr. GARRETT. Okay. And what about the time to implement these changes? As you said, a lot this has been looked at for a long period of time. Regulation NMS took a long time in order to implement. We are talking here about implementing this like this quickly. Is there a problem if we move too quickly at this point in time, or is this just the right thing to do?

Mr. NOLL. I think on the marketwide circuit breaker issue, I think we can move very quickly on that. I think the chairman will be discussing with us making rule filings, adopting new marketwide circuit breakers, relatively shortly, and then we will process those and put them in place very efficaciously.

I think as we deal with some of the stock-by-stock issues, we may run across some technology issues with that—

Mr. GARRETT. What issues? I am sorry.

Mr. NOLL. There may be some technological issues putting them in place, but I think those are short-dated, not long-dated.

Mr. GARRETT. Thank you. I thank the Chair. Thank you to the witnesses.

Chairman KANJORSKI. Thank you very much, Mr. Garrett.

The gentleman from California, Mr. Sherman.

Mr. SHERMAN. Thank you.

We are talking here about how to make high-frequency trading safer. The question is, does it fulfill any social utility at all? In the old days, somebody would want to sell a stock for \$10 and somebody else might want to buy it for \$10.05. I remember when there was an 18th of a point. Somewhere, there was a settlement in between, and maybe—or the other of those two real investors got a slightly better deal. Now there is somebody with a fast computer who can come in and scoop up that 5 cents to make sure that neither of the real investors benefits from it.

I realize Wall Street makes a lot of money from all this high-frequency trading, but the question is: Does it help provide liquidity or in some other way allocate capital? Now, the events of last week seem to indicate that high-frequency trading doesn't provide liquidity, it uses up liquidity, demands liquidity, and in fact, there was no liquidity for a few minutes.

I will start with Mr. Leibowitz. If we didn't have high-frequency trading, would this hurt the companies that are doing business and their employees?

Mr. LEIBOWITZ. Sure, though I am going to stay away from whether there is any social value to this. What I will say is, the market-makers have existed for hundreds of years, so it is not correct to say that in the past if somebody sold at \$10 and they wanted to buy at \$10.05, they matched up. The difference is they were physical people, whether sitting on the floor of the stock or market-makers at NASDAQ. But there has always been a middleman in trading, and what they do is they match up buyers and sellers. Sometimes they play a role, sometimes they actually don't, they just match them together. And sometimes when somebody wants to sell, the buyer doesn't happen to be there. So they are matching different time horizons on the buy and the sell.

I think as technology caused trading to speed up, people were unable to keep up with that in a market-making capacity. That is why the specialists have been replaced by what we call "designated market-makers," who in effect are high-frequency traders, but they have obligations into our market. They have to have a quoting requirement. They have to provide a certain amount of liquidity. They are not allowed to take more than a certain amount of liquidity from the market. So they are high-frequency traders that operate in a very structured environment.

Mr. SHERMAN. What percentage of the high-frequency trading is done by these—I will use the old term, "market-makers?"

Mr. LEIBOWITZ. I would say first, in the case of DMMs, they provide 10 percent of the liquidity to the New York Stock Exchange market. There is another form of market-maker that we have also in that variety that is another 10 percent. I would say on the broader market—

Mr. SHERMAN. If I can interrupt, because I only have 5 minutes, I am not asking what percentage of liquidity is provided by these individuals, I am asking what percent of the high-frequency trading.

It has been reported that two-thirds of the trades in the United States are these high-frequency traders; you are describing what would seem to be just a very small percentage of the high-frequency traders.

Mr. LEIBOWITZ. I would estimate that about 40 to 45 percent of the market is high-frequency market-makers of some form, either DMMs, SOPs or other things. The balance of what you make into that two-thirds is really algorithmic trading. That could be a big mutual fund deciding to sell 10 million shares in an electronic form that is implemented in a series of small trades that looks like a high-frequency trade.

So you have to be really careful, and that is why we heartily endorse Chairman Schapiro's large trader reporting scheme where we

can get some transparency into what these high-frequency trades are doing.

Mr. SHERMAN. Most of us, when we think in terms of high-frequency trading, are looking at those buying and selling the same stock within a short window, not somebody who is selling it and selling it and selling it; which, as you say, could be an investor deciding to unload a stock or a portion of it.

Mr. Noll, do you have a comment on this?

Mr. NOLL. Yes. I think when you look at—notwithstanding last Thursday's events, I think if you look at the quality of our markets over the last number of years, I think you would see an increasing tightening of the bid-offer spread and an increasing provision of liquidity at those tighter spreads.

So I think our concern would be as we look at this issue—and we agree with Mr. Leibowitz and Chairman Schapiro that we do really have to study what high-frequency traders are doing and how they are operating in the marketplace—I think the *prima facie* evidence is, however, that they provide a real value in the sense they provide deep markets, they provide tighter bid-offer spreads, they have reduced costs for all market participants to access the markets.

I do think, however, that we need to also look at how they interact in the market on an ongoing basis. I think they have to provide real liquidity.

Mr. SHERMAN. Obviously, last week they were the cause of the absence of liquidity. But I believe my time has expired. You can respond further for the record.

Mr. NOLL. I would say that we are not sure that is in fact the case. I think it is an overstatement to say that we know it was high-frequency traders. I think that is an issue that we are continuing to look at at this point. It appears to have been a very broad market selloff with many market participants, not just high-frequency traders involved in that.

Chairman KANJORSKI. The gentleman from Alabama, Mr. Bachus.

Mr. BACHUS. I know history teaches us there have been some pretty dramatic falls in the market before we even had electronic trading, so I don't think the culprit is high-frequency trading. I guess that is part of the debate.

One thing I think we can never prevent is negative market developments or economic developments from affecting the market, so I am just trying to think of—you have shifts in sentiment, so that is going to move the market and cause changes in volatility. So what you really want is the market to reflect all those things and to do it, I guess, as efficiently as possible.

I am very encouraged by what I hear today and what happened yesterday, in that I think that there has been, maybe as a result of last Thursday, and the concern that I think everyone had before, is that we are coming into an agreement that there ought to be some sort of marketwide circuit breakers. Is that right? Do you all agree on that?

Mr. LEIBOWITZ. Absolutely.

Mr. NOLL. Absolutely.

Mr. BACHUS. And coordinated maybe stock-by-stock circuit breakers?

Mr. NOLL. We all agree with that.

Mr. BACHUS. Mr. Duffy, do you agree with that?

Mr. DUFFY. Yes. We agree with that and we see no issue with that. But, again, this is not pertaining to the CME Group. We don't trade individual stocks.

Mr. BACHUS. Okay. I guess if you trade an option or you trade an ETF or something, you trade options, do you trade those?

Mr. DUFFY. The CME Group, no. We trade futures. We trade options on futures. We don't trade the SPDR.

Mr. BACHUS. All right. Let me ask all of you, we have kind of gone from a highly structured duopoly, at least with stock trading, to a much more fragmented system. How would you advise the regulators to meet the challenges of addressing marked integrity and price discovery without hurting competition?

Mr. DUFFY. I will be happy to start, even though I think this is more your bailiwick, but I will jump in.

I do think that you need to have the same set of standards and protocols across the multiple markets, and I think it is as simple as that. You can't have one set of rules at the NYSE and at NASDAQ, and then you have different sets of rules at BATS and other ECNs. It is not going to work. It is a recipe for disaster. No one has been able to explain how Accenture went from \$41 to a penny yet, and that to me is just amazing, how you can't explain that. I think you have to have the same protocol across these marketplaces.

Mr. BACHUS. All right. Mr. Leibowitz or Mr. Noll?

Mr. LEIBOWITZ. Sure. I think that it is clear that the complexity of our market represents a challenge for regulators. There is no doubt about it. And I think that the SEC is trying to respond to that challenge.

I think the concept, the release that they just issued to review various aspects, whether it is ATSSs, whether it is Reg NMS, whether it is sponsored access, are all exactly well-timed, and they just need the resources and need to be nimble enough to get through that.

I think the challenge is that it is just that we are in an environment that is relatively complex, and small changes have unintended consequences. So for example, just saying, "Let's ban high-frequency trading," I think we would be stunned with the consequences. I think that even small changes have very big effects that we may not see, and they just need to be careful, while at the same time moving quickly when we see a problem where we all agree, like marketwide circuit breakers on individual stocks. That is easy one. That is a no-brainer.

Mr. NOLL. I would agree with Mr. Leibowitz. And I think some of the things that we have talked about already indicate that we are moving in that direction, both on marketwide circuit breakers on individual stocks changing marketwide circuit breakers on the entire market as well as talking about things like the consolidated audit trail and other functionality that we give the SEC.

I think this is a very complex market. I think Chairman Schapiro and Chairman Gensler are fully aware of how complex it is and

have the tools and intellectual capital to deal with that. And we are here to assist them to do with that.

Mr. BACHUS. All right.

Mr. Leibowitz, what you said I agree with, that the markets and exchanges handled volatility quite well during the financial crisis in 2008. They didn't react quite as well to the volatility last Thursday. What do you see is the difference?

Mr. LEIBOWITZ. It is interesting because we actually discussed this at considerable length. And I think it has to do with things happening at a certain point in the day. A lot of the news on the financial crisis came out overnight, where markets had a chance to absorb that news.

This is something that happened during the day. And, as Mr. Noll was saying, it was almost, like, set up. The market was in a jittery situation. The VIX was rising. There was nervousness about Europe. And then there was the speculation through the day and the announcement of what was going on in Greece. And it really just happened at a bad time.

Had that news come out overnight, my guess is we would not have seen nearly the sort of swing that we saw during the day.

Mr. BACHUS. All right. Thank you.

Mr. SCOTT. [presiding] Let me follow up on that. Let me ask this question on the circuit breaker concept.

Right now, we are in a situation where we have computers which are using very difficult mathematical formulas to trade millions of shares of stock in milliseconds. And our solution to this, as I hear you say, and Chairmen Schapiro and Gensler, is to institute stock-by-stock circuit breakers marketwide in a centralized way.

I saw a movie about a couple of weeks ago, and it is a fun movie if you want to see it. It is called "Eagle Eye." I don't know if you saw that movie, but if you get a chance, it is very interesting. It just simply points out what happens in concentrating and putting so much control into a computer.

So what I want to ask each of you—because, apparently, as I hear your testimony, particularly the New York Stock Exchange, have said that you have circuit breakers. The complaint was that maybe that moved too slow.

So, as we debate this issue of circuit breakers, I want each of you to tell us, are there any downsides? Is there anything we have to fear here? Is there an element of freedom that takes out of the free enterprise system the freedom of the market exchange?

Let us be very clear. Is there anything we have to fear if this is the solution of putting this much control in a stock-by-stock, marketwide, one central location of a circuit breaker?

Mr. NOLL. If I could address that in two parts, Mr. Chairman. I think the issue for us is that technology, in and of itself, is a tool. It is a tool used by market participants and, I think, used very effectively by market participants. We view the functioning of our market and its continuous operation as one of the envies of the world. And, generally, with the exception of that 17-minute period on May 6th, it functions extraordinarily well.

And I would argue, even during that period of time, our technology functioned well, but the market participants that were on our market experienced an absence of liquidity. So what we are

really concerned about here is when our markets become dysfunctional.

And I think what the chairman has proposed and what we have discussed as exchanges is not putting centralized control over the marketwide, stock-by-stock circuit breakers, but adopting similar rules so that we all have the same standard rule for when a stock gets halted.

We each have our own technology. We will continue to operate our own technology separately from one another, with the oversight of the SEC. So I don't think that we are talking about a central computer that is going to control this. I think what we are talking about is a coordination of our rule sets with one another on when a marketwide, stock-by-stock halt should be called.

Mr. SCOTT. Okay.

Mr. LEIBOWITZ. I think we would agree with Mr. Noll, which is that information is transmitted to the market faster and faster. When events happen, it just ripples through the market. It is on CNBC within seconds. And the fact that trading is speeding up every day means that the market reacts faster.

I think all this is really designed to do is cause a quick pause to make sure that everybody understands what is happening and the symbols of liquidity so that we don't hit a down pocket like we did before.

I think all of us are strong believers in free market. We compete with each other, and we compete with each other aggressively. And yet we can agree on certain principles like these circuit breakers that I think make the market far better for investors. Because, in the end, if we don't very a market that investors believe in, if they feel it is a rigged game, they are not going to invest their money. That is going to harm capital formation, retirement savings, all of these things.

Mr. SCOTT. Mr. Duffy?

Mr. DUFFY. Mr. Scott, I think you asked a very interesting question, which is, what about technology? We continue to build it; will it eventually consume us, is what I think I heard your question to be, and what are we doing besides putting circuit breakers in place to make sure that events like this don't happen again?

There is more to it than just circuit breakers, sir. There is pre-execution. There are multiple different technology vendors you have to go to. But then you have to really get into what is the most important, in my opinion; you have to have an experienced risk management team. You have to have a deep regulatory department within your institution to make certain that all these transactions are done legitimately and your technology team can work with your management team and your risk management parameters to make certain that these computers don't go out of control.

Mr. SCOTT. Exactly. That is my point. I know my time is up here, but that is a very serious point. Because if we are going to coordinate this, there has to be some mechanism that triggers it.

And I think that was the failure in the New York Stock Exchange. You have a circuit breaker there, and apparently it did not work because of something with the trigger. Is that correct?

Mr. LEIBOWITZ. No, that is not correct, actually.

Mr. SCOTT. All right.

Mr. LEIBOWITZ. Our circuit breakers actually triggered perfectly well. The problem is that in the current U.S. market regulations, the other venues don't have to obey us when we are in a circuit breaker mode.

Mr. SCOTT. I see.

Mr. LEIBOWITZ. So it worked perfectly well for our market and for any other markets that observed our circuit breaker. However, it clearly shows a failing in our market if another market doesn't have to follow that circuit breaker. So that is why we have agreed on marketwide circuit breakers.

But I would agree with Mr. Duffy that this doesn't end the conversation. We have to continually look at ways that we can safeguard the market, that we can make sure the technology is doing what it is supposed to be doing, and that we don't, sort of, go down this path.

Mr. SCOTT. My final point on this, and I will be finished, is: If we go with this circuit breaker, marketwide, stock by stock, from each of you very quickly, is there any downside? Is there anything we have to worry about if we go this way?

Mr. NOLL. I think, very quickly on that point, I think the only downside is the true price discovery is not being found.

Mr. SCOTT. I am sorry?

Mr. NOLL. The true price discovery could be interfered with. So I think it is important for us, as we design these marketwide, stock-by-stock circuit breakers, if we do so, that we want to make sure that buyers and sellers are able to find each other in an efficient and fair fashion but that we aren't otherwise closing off price discovery inadvertently. Because the impact of that closing it off will re-effect itself when the stock starts to trade again, and you will have this cascading effect as opposed to true price discovery.

Mr. SCOTT. All right. Thank you.

Mr. DUFFY. I do believe that Mr. Noll is correct, but I also believe that price discovery is done throughout a period of the trading session, not on a microsecond. So you do need to discover price over a period of time and let everybody participate. So I hear what he is saying, but at the same time I don't completely agree with that.

Mr. SCOTT. All right.

Mr. Leibowitz?

Mr. LEIBOWITZ. I think it is incumbent upon us to build these circuit breakers in a way that helps the market function properly, go through the auction process, which is what is supposed to happen, and give the market a chance to pause and establish the right price.

I think Mr. Noll is right. If we don't do a good job of it, then we will be in the same place we were. But it is incumbent on us, as exchanges, to work together to make that process work properly.

Mr. SCOTT. Thank you very much. My time is way past. I thank the rest of the committee for my indulgence.

Ms. Biggert?

Mrs. BIGGERT. Thank you, Mr. Chairman.

Mr. Duffy, in your testimony, you talked about the stop price logic. You also highlight a number of risk management controls used at CME in addition to the circuit breaker rules.



Specifically, could you walk us through the difference between the circuit breakers and the stop price logic employed at CME?

Mr. DUFFY. Sure. Circuit breakers, as we all know, were coordinated amongst the securities exchanges with the futures exchanges. There is a 10 percent, 20 percent, 30 percent circuit breaker depending on what time of day it happens. So, in the first half of the day, up until 1:30, it is 10 percent of the market. Then it goes to 20 percent, and then it goes—if it goes to 30 percent of the market, the market is closed all day.

What the stop functionality that we have deployed at CME Group is, if our market goes up or down in a—roughly, if you used the equivalent price of the E-mini S&P contract today or the S&P index, it is a half of 1 percent. If it cannot find liquidity to fill that order in a half of 1 percent, it stops for 5 seconds, it allows the market to take a breath to try to seek liquidity. If it cannot seek liquidity in that 5-second period, it will then halt another 5 seconds and then try to seek the liquidity again. So that is the way the stop logic functionality works.

And then, obviously, we have the circuit breakers in place also, in coordination with the—

Mrs. BIGGERT. Then what happened on Thursday that stabilized the market activity?

Mr. DUFFY. There is no question, Congresswoman—we brought these charts for a purpose because they absolutely make sense. And you can see that the stop logic worked. The futures market stop logic kicked in. People had an opportunity to assemble liquidity. The market started to go the other direction, and we led that direction. So I think our functionality worked flawlessly.

Mrs. BIGGERT. You say that this functionality is not available in the securities market. Is it just because they don't use it or—

Mr. DUFFY. To be perfectly honest with you, this is patented technology by CME Group. And I am certain that we would be happy, without a cost, to give it to the securities exchanges if this made the whole system better.

Mrs. BIGGERT. So it can work for, really, any individual stocks or—

Mr. DUFFY. We do believe it could.

Mrs. BIGGERT. Okay.

I would also like to ask the other gentlemen, Mr. Noll and Mr. Leibowitz, would you consider using this? Do you think that this would be available?

Mr. LEIBOWITZ. I think we would consider all options. But, on the other hand, right now we actually have a circuit breaker, the functionality of which works. The problem is it is not marketwide.

So the LRPs are very similar, hopefully not patent-infringing on what the CME is doing. In terms of what we do is if the stock moves a certain amount in a certain amount of time, and that amount is gauged by how much liquidity in the stock and what the stock price is, it triggers a slow quote, in which case we take some amount of time to attract liquidity and unwind the slow quote. So it is very similar to what the CME does, except theirs is fully automated, as I understand it, just triggered by time. Ours involves DMM involvement to unwind it.

Now, each exchange, we will figure out a way, Mr. Noll will figure out a way for NASDAQ, we will discuss the rules for implementing—but, essentially, in the end, the stock circuit breakers will be very similar to the stop-loss pauses that Mr. Duffy has explained.

Mrs. BIGGERT. Except that it is not now. It didn't work on Thursday.

Mr. LEIBOWITZ. No, I disagree. They actually worked in the New York Stock Exchange market. The failure was that not all the markets were obeying them. So what we need to do is just implement them. Whether we implement his version, Mr. Duffy's version, or a slightly different version, because securities do trade slightly differently, we will figure that out.

But this is really—as Mr. Noll said, it is an implementation from a technology standpoint, because we, as exchanges, and the SEC have agreed essentially on a framework for going forward with that.

Mrs. BIGGERT. In other words, for it to work, it has to be implemented across all market venues?

Mr. LEIBOWITZ. What will most likely happen is it is a listing venue; so, in the case of—when I say “listing stocks,” our exchange—in the case of NASDAQ listed stocks, NASDAQ will implement the stop-loss trigger, and the other markets will have to obey it with respect to their listed stocks, as I understand it.

Mrs. BIGGERT. Okay.

Mr. NOLL. I agree. I think that is where we will end up.

Mrs. BIGGERT. Mr. Noll, I am sorry. I didn't hear you.

Mr. NOLL. I said that I think that is where we will end up, where the listing venue will determine when a stock should be halted across the markets, and all the other listing venues will obey that stock.

Mrs. BIGGERT. How long do you think this will take to work that out?

Mr. NOLL. I think the rules set or at least an understanding of the functionality will probably take place over the next couple of days, where we will all agree on this is the outside framework in which we should operate this—the marketwide stock-by-stock framework in.

The actual implementation, I think, is still subject to all of us revisiting our technology and revisiting how long it will take us to implement that.

Mr. LEIBOWITZ. Right. I think we are going to have answers. We all have this as a high-priority item. Obviously, as the New York Stock Exchange, we would throw out using our system and having everybody obey the circuit breakers that are now in place, but we recognize that is not amenable to most market participants.

Mrs. BIGGERT. Okay.

Thank you. I yield back.

Mr. SCOTT. Thank you.

Now the gentleman from Indiana, Mr. Carson.

Mr. CARSON. Thank you, Mr. Chairman.

A question for Mr. Duffy, even though no one had answers on May 6th, CME took the unusual step of commenting on individual

participation in its markets when it denied that Citigroup may have executed an irregular trade.

First, how was CME able, during that frenetic day, to absolve Citigroup of any involvement? And, second, how do you reconcile CME's Citigroup statement with its policy of not commenting on individual market participation?

Mr. DUFFY. Congressman, that is a great question. It was a very difficult situation for us at the time because you have to realize we are working on real time, with the situation happening, with the rumors that somebody from Citigroup entered in a \$16 million notional transaction in the E-mini and instead entered \$16 billion of notional into the E-mini. We knew, because of the systems we have in place, that was categorically false.

We could ring-fence Citibank's inventory that they did on CME Group on a real-time basis within moments. We traditionally would not ever make statements like that because of the situation the banks have been in. We thought it was the prudent thing to do on Citibank's behalf and, actually, on behalf of the taxpayers, since they own such a big portion of Citi. We thought it was the right thing to do to make the statement to make sure the rumor went away.

Mr. CARSON. Mr. Leibowitz, although the cause of the May 6th volatility spike has yet to be determined, do preliminary investigations indicate flaws in the current regulatory framework? And, also, can regulatory improvements, whether at the SEC or the CFTC or exchange levels, prevent what essentially could be an extraordinary technological glitch?

Mr. LEIBOWITZ. I think what we have recognized is the lack of marketwide circuit breakers that everyone obeys on a stock-by-stock basis is clearly a failure among our markets to work together properly and create the right market environment.

I think the SEC concept review, which they are doing right now, will help identify other areas where we may feel that either regulation is lacking; maybe there is not enough surveillance. I think many of us believe, at this point, that centralized surveillance is critical in this market.

To be honest, I feel sorry for the SEC staff who has to assemble from 40 different venues the amount of data they have done. And they have done amazing work in doing it. But we need to not be in this situation going forward, and I think we are committed and I know Mr. Noll's group is committed to working with the SEC to make that happen.

Mr. CARSON. Okay. And lastly, Mr. Noll, can you please give us a rundown of the decision-making process that resulted in the cancellation of almost 300 trades of stocks and exchange-traded funds?

Mr. NOLL. Sure, I would be happy to do that.

First of all, I think it is important to note that this was a multi-exchange decision. All the marketplaces participated in the decision to break the trades that occurred in that period of time between 2:40 and 3:00, so it was not one market making the decision on behalf of all others; it was all markets in consultation with one another.

And I think we were governed by two things that influenced our decision-making process there. The first one was: When, in fact, did

the markets become disorderly as opposed to orderly? So, if you look at some of the time in sales and some of the trades that occurred in that period of time, their fall, even though it was drastic and fast, was what we would call orderly. In other words, they were walking down the order books step-by-step in the way they were supposed to happen. It was only at the very bottom where we started to see very anomalous prints. So we were very concerned about drawing the line at a level where we addressed the anomalous prints and not the, sort of, order-by-order orderly trading that was going on.

And we were very cognizant of what I would call the moral hazard problem, which is that people should bear the consequences of their actions. We didn't know who was going to win or lose by drawing the line where we did, but we were sure that below that line, we were capturing the bulk of the anomalous trades, but above that line, people's behavior—they bear some consequence for that. And so, whether they won or lost during that period of time, they should bear that consequence for being a market participant there.

So we were very cognizant not to reward people for bad behavior, but to save people from what we considered to be an anomalous failure of the markets at that particular time.

Mr. CARSON. Thank you, sir.

Mr. Chairman, I yield back.

Mr. SCOTT. Thank you very much.

The gentleman from Indiana, Mr. Manzullo—I am sorry, Illinois. I apologize.

Mr. MANZULLO. It is close.

Mr. Duffy, on page 1 of your testimony, you state that, "The most significant equity index futures contract traded on the CME Group exchanges is the E-mini S&P 500 futures contract."

Mr. DUFFY. Yes, sir.

Mr. MANZULLO. And then, also, "In 2009, the average daily volume for the E-mini S&P 500 futures contract was 2,207,596 contracts."

And then you continue that theme on page 2. You discuss the trading data for the time period between 1:00 and 2:00 Central Standard Time. Your analysis of the trading activity during that hour indicates that the E-mini S&P futures contract was not the triggering event. I have heard reports that the E-mini S&P futures contract led the sell-off that precipitated the decline of the Dow.

Can you walk us through what happened with the E-mini and your thoughts on what may have been the true triggering event?

Mr. DUFFY. I think we have heard a lot about different events in the marketplace leading up to the time coming into question. The volume in the E-mini was heavy. This is not unusual. E-mini trades about 4X or 4 times the amount of the SPDR contract. At that particular time, we traded about 10 times the volume. So we saw a flight to quality, to CME Group, to trade our most highly liquid product.

As I said earlier, futures contracts, by design, are indicators of people's potential viewpoint on what they think is going to happen. So they are traditionally leaders, up and down, in the marketplace.

And, again, our markets operated within all the protocols of CME's systems. So we didn't have any "fat-finger" issues; we were confident of that. The market was moving quite rapidly. At the same time, there were a lot of macroeconomic events that were happening.

So, yes, it was unusual activity. Nobody is going to deny that. It happened, and it happened quickly. But, again, we didn't bust trades. We looked at some of the algorithmic traders, as has been questioned here. They were basically more liquidity providers at the time in question; they were not aggressors or taking the market. So they were there on both sides, bid and offer. So they were leading the market because of the nature of the product, sir.

And then, as you could see, our stop logic worked, and the listed stocks kept going down for whatever reason. That is still yet to be explained, why they went to the prices they did. We did not trigger, which would have been only—a stop circuit breaker for CME would have been the 20 percent circuit breaker that is instituted amongst all the exchanges, and we were roughly about 9.5 percent at the lowest point in the S&P contract, sir.

Mr. MANZULLO. Let me ask you an unrelated question because something obviously—maybe not obviously, but apparently something spooked the market. Anything to do with the problem in Greece or worldwide activity or inability to predict what is going on with regard to the euro? Do you see any connection there at all, or is it just a coincidence?

Mr. DUFFY. I have seen a lot of high volatility, sir, especially coming into that day. So all those events were on the front page, so I am sure they had a contributing factor to the market conditions that led up to the precipitous down-move.

And, at the same time, you have to remember we saw a couple stocks trading at a penny that were \$40 stocks. So one was probably wondering what was going on in the marketplace.

Mr. MANZULLO. Mr. Noll, would you like to comment on that last question?

Mr. NOLL. On the volatility in the marketplace at that time?

Mr. MANZULLO. Yes.

Mr. NOLL. Yes, I—

Mr. MANZULLO. It doesn't have to be a precise answer because no one knows.

Mr. NOLL. I don't think we have a precise answer yet, and I am not sure that we will ever get a precise answer as to the nature of what was the root cause of the uncertainty in the marketplace.

But I do think what is very clear is that we saw an increasing amount of volatility on the days leading up to May 6th. We have seen the spike in all the measurements of volatility. The day of May 6th itself was already a volatile day before the events we are talking about here happened. So it was already a severe down day. It was also the third day in a row of down equity markets.

So I think when we hit these air pockets or this confluence of events, if I could call it that, we were in a position where there was just a massive downdraft in the marketplace, which we recovered from, but nonetheless I think it is important for us to address the causes and to prevent that from happening going forward.

Mr. MANZULLO. Mr. Leibowitz?

Mr. LEIBOWITZ. Yes, I think the two gentleman to my left have hit it right, which is it was a spooked market—I think you even used that term. The market became very illiquid and choppy. And it is very likely that some news out of Europe might have gotten people selling.

But I think the behavior that you then saw, selling some stocks down to a penny, that is not permissible behavior. That is a market structure failure that we have it incumbent upon us to correct.

On the other hand, markets are allowed to sell off in a reasonable way. And so, if investors were afraid of Greece and the euro and anything else that was going on, they should be selling the market off. What we are really addressing is, is it happening in a reasonable and orderly way? Are investors being disadvantaged by events transpiring on the exchange? It would be hard to justify to a retail investor that he sold the stock at a penny.

And so, that clearly has to be addressed. The fact that something triggered a sell-off—if we can't find an actual cause, meaning a trader or—and there are so many rumors, and that is part of—what we live with that every day in our market. The rumors get transmitted so quickly that we just have to deal with that.

Mr. MANZULLO. Mr. Chairman, could I ask one more question?

Mr. SCOTT. Yes, you may.

Mr. MANZULLO. Thank you.

Your answers take into consideration or are obviously based upon the fact that there really wasn't anybody out there who “made a killing” that day. Is that correct? There is no bad person out there or somebody that you can say, look what he or she or they did as a group that caused this?

Mr. NOLL. I think the investigations and looking at the evidence will take place over the next couple of days and weeks until all the determinations are made of everyone's behavior, whether it was good or bad or within the rules or not within the rules.

As of today, on the NASDAQ systems and in the NASDAQ market, we have not seen anything that would suggest to us that anyone was behaving in an inappropriate fashion.

Mr. LEIBOWITZ. And I would say quite the opposite of making a killing, if algorithmic traders did, in fact, follow the market down, chances are they got hurt pretty badly, because the market just snapped right back and they sold way below where the market ended up.

So, while retail investors and others followed it down with them, my guess is whoever led it down, intentionally or not, did not make a killing.

Mr. MANZULLO. Okay.

Mr. DUFFY. Congressman, yes, I agree with both of these gentlemen. I have not heard anything extraordinary. But, then again, it is a sensitive topic, and we will let our regulatory departments investigate that with due process.

Mr. MANZULLO. Thank you.

Mr. SCOTT. Thank you, sir.

Now, we will hear from the gentleman from New Jersey, Mr. Garrett.

Mr. GARRETT. Just with one last question. And I appreciate all your time here.

You are all on board with the circuit breaker idea, and I have spent a lot of time on it. And, Mr. Duffy, I think you just mentioned with what your system, as far as the 20 percent—

Mr. DUFFY. Our system on a circuit breaker?

Mr. GARRETT. Yes.

Mr. DUFFY. It is basically—the way that it works today, it goes down roughly a half a percent of what the value of the S&P contract is today. If it doesn't have the liquidity to fill the number of contracts, buy or sell, it will halt for 5 seconds, and then it will try to attract that liquidity. If it doesn't do it, it will try to halt another 5 seconds to attract that liquidity to fill the order in that period.

Mr. GARRETT. Okay.

And from the other gentlemen, when you will be meeting with Chairman Schapiro and the rest in the next few days and what have you to try to come up with uniformity on these issues, is there a lower level that you would say this was just not a realistic figure?

If you here at my opening comment, I said there were rumors out there saying that you are looking at bands of 2 percent or so that would just be too restrictive for individual stocks and what have you. So what is the appropriate level? That is my final question.

Mr. NOLL. Yes, I think we are still engaged in that effort of determining the appropriate level. I happen to share your concern that we not draw the bands too tightly.

Mr. GARRETT. And what is that?

Mr. NOLL. I think 2 percent, quite frankly, is too tight. I think what we saw on Thursday was the LRP functionality going off at 2 percent levels, which caused dislocations in the marketplace, perhaps unintentionally, but nonetheless caused dislocations in the marketplace, while other markets continued to provide liquidity at that level.

So, I think as Larry has suggested earlier, we need to agree on what the right, appropriate levels are. I don't think 2 percent is the right level. We tend to believe that it should be 10 percent. But I think that is still a moving target for all of us.

Mr. LEIBOWITZ. Yes, I would agree with Mr. Noll 100 percent. We use for our LRPs relatively tight bands. In Procter & Gamble, it actually is about 2 percent. But the intention is to continue trading and get it going relatively quickly.

Mr. GARRETT. Right.

Mr. LEIBOWITZ. I think for this, we are going to use broader bands, because we want them to be marketwide and we need everyone to agree to them.

Mr. DUFFY. Congressman, if I could just make one comment, the 10 percent, 20 percent, and 30 percent, which the gentleman is referring to here, can certainly be narrowed, but I think if you narrow those percentages, what is more important then is to narrow the timeframe that the markets close, because they will be seeking liquidity at other venues, whether it is overseas or somewhere else.

So if you narrowed a time to 5, 15, and 10—whatever you want to come up with, pick your favorite number, you can't be closed for an hour or you can't be closed all day. You narrow those time windows and narrow the bands, and it will work out for everybody.

Mr. LEIBOWITZ. Yes, I think that is a great point. On a stock-by-stock basis, we are talking about a couple of minutes at most. And

on a marketwide basis, as we narrow the marketwide bands, we are really talking about moving the timeframe in for the close, so it is not as long a close as it was in the past.

Mr. GARRETT. Yes. That is a good point about overseas trades. I was going to bring that up before, but—

Mr. DUFFY. That is exactly where it will go, sir.

Mr. GARRETT. —thank you, Mr. Chairman.

Mr. SCOTT. Thank you, Mr. Garrett.

I want to thank each of you—Mr. Leibowitz, Mr. Noll, Mr. Duffy, and also Chairman Schapiro and Chairman Gensler—for your excellent, superb, and well-presented testimony today on this very critical issue as we move to make sure we maintain the strongest investor confidence in our financial markets and in our investor trading. Thank you again, very, very much, for coming before our committee and helping us with this.

The Chair notes that some members may have additional questions for this panel which they may wish to submit in writing. Without objection, the hearing record will remain open for 30 days for members to submit written questions to these witnesses and to place their responses in the record.

Before we adjourn, the following will be made part of the record of this hearing: the written statement of Commissioner Bart Chilton, Commodities Future Trading Commission. Without objection, it is so ordered.

The panel is dismissed, and this hearing is adjourned.

[Whereupon, at 6:32 p.m., the hearing was adjourned.]



# **A P P E N D I X**

May 11, 2010

**OPENING STATEMENT OF  
CHAIRMAN PAUL E. KANJORSKI  
SUBCOMMITTEE ON CAPITAL MARKETS, INSURANCE,  
AND GOVERNMENT SPONSORED ENTERPRISES  
HEARING ON "THE STOCK MARKET PLUNGE:  
WHAT HAPPENED AND WHAT IS NEXT?"  
MAY 11, 2010**

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Good afternoon. At today's hearing we will examine the frightening afternoon of May 6, one of the most volatile trading days in history. Within minutes, stock market indices dropped precipitously, erasing more than \$1 trillion in capitalization before recovering. While we may not yet have all of the facts about these events, we must quickly analyze what happened and embrace reforms in order to restore market integrity and promote investor confidence.

Going back to 2003, questions surrounding market structure have received considerable attention in this Subcommittee. Many of the issues we have previously explored remain just as relevant today, especially the long-standing debates of man versus machine and price versus speed. These prior hearings have also taught me that our regulators must remain nimble by continuing to adapt market structure rules to respond to an ever evolving environment.

Technological advances have dramatically altered the way Wall Street operates. Such progress is natural. For the United States to continue to lead the world's capital markets, we must continue to encourage innovation.

But, change also can have its downsides. Many have cited the role of computers in contributing to and exacerbating last week's gyrations. In recent years, high-frequency trading has exploded. Barely a blip two decades ago when technology constraints and growth last crashed the markets, automated traders today move in milliseconds and make up as much as two-thirds of daily trading volume. Their decisions to trade -- or not to trade -- can produce real consequences. We, too, have moved from a model of two major trading centers to an electronic network with dozens of marketplaces for trading equities, creating new headaches for regulators.

The ascendancy of computerized trading and automated exchanges in our capital markets appears to have created a plot as intriguing as *2001: A Space Odyssey*. Today, however, is 2010, and we must figure out how to effectively balance artificial intelligence with human judgment. This hearing will help us to achieve that goal. It can also help us to determine how to harness technology to create effective audit trails for regulators.

Somewhere along the way, competition among exchanges, alternative trading systems, and others has additionally led to increased fragmentation. As old trading methods have given way to modern techniques, the rules governing our market architecture have lagged behind. We now must better integrate our markets. In this regard, I am encouraged that regulators and exchanges are already working together to adopt new rules for creating uniform single-stock circuit breakers and updating archaic market-wide trading halts.

Most importantly, we must protect investors' interests. They deserve fair and orderly markets, which the Securities and Exchange Commission exists to ensure. Despite this mandate, the markets were hardly fair or orderly during last Thursday's roller-coaster ride.

In this turmoil, some investors lost mightily. One recent news story highlights a couple who lost \$100,000 because their trade cleared at the wrong moment during Thursday's chaos. This turbulence additionally triggered costly stop-loss orders for too many investors and may have placed others in unintended short positions as trades unwound. The market mayhem also unfortunately revealed the arbitrariness of the process for identifying and canceling "clearly erroneous" trades. Moreover, the decision to rescind some trades may have ultimately benefited those who aided and abetted the plunge. This is wrong. They placed a bet and deserved to lose.

Although stock values quickly sprung back this time, the experience may prove quite different next time. A ghost-in-the-machine scenario in which an enormous computer sell-off sparks a vicious cycle of selling and panic seems completely plausible. To thwart this doomsday hypothetical, regulators must act with great speed and great care to promulgate new rules. The SEC has already begun this process with its January concept release on market structure.

In sum, our witnesses can shed light on the 20 harrowing minutes of last week's flash crash. They can also explain how we should respond to technological advances, increased competition, and other market evolutions in ways that best protect investors. I thank each of the witnesses for appearing, especially on such short notice, and am eager to hear their testimony.

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TESTIMONY  
OF  
TERRENCE A. DUFFY  
EXECUTIVE CHAIRMAN  
CME GROUP INC.  
BEFORE THE  
Subcommittee on Capital Markets, Insurance and Government Sponsored  
Enterprises of the  
HOUSE COMMITTEE ON FINANCIAL SERVICES  
May 11, 2010

I am Terrence A. Duffy, executive chairman of CME Group Inc. Thank you Chairman Kanjorski and Ranking Member Garrett for inviting us to testify today. You asked us to discuss issues surrounding the activity in the equity markets on Thursday, May 6, 2010, including our thoughts on market integrity and how our markets functioned on that date, the effectiveness of the existing market structure rules and the role of technology in our markets.

CME Group is the world's largest and most diverse derivatives marketplace. We are the parent of four separate regulated exchanges, including Chicago Mercantile Exchange Inc. ("CME"), the Board of Trade of the City of Chicago, Inc. ("CBOT"), the New York Mercantile Exchange, Inc. ("NYMEX") and the Commodity Exchange, Inc. ("COMEX"). The CME Group Exchanges offer the widest range of benchmark products available across all major asset classes, including futures and options on futures based on interest rates, equity indexes, foreign exchange, energy, metals, agricultural commodities, and alternative investment products. The CME Group Exchanges serve the hedging, risk management and trading needs of our global customer base by facilitating transactions through the CME Globex® electronic trading platform, our open outcry trading facilities in New York and Chicago, as well as through privately negotiated CME ClearPort transactions.

The equity index futures contracts traded on CME Group designated contract markets provide an essential risk management function, allowing investors to hedge their exposure against a portfolio of shares or equity options. The most significant equity index futures contract traded on the CME Group Exchanges is the E-mini S&P 500 futures contract. In 2009, average daily volume for the E-mini S&P 500 futures contract was 2,207,596 contracts.

**I. Introduction**

Over the past four days, CME Group has engaged in a detailed analysis regarding trading activity in its markets on Thursday, May 6, 2010. Our preliminary review indicates that our markets functioned properly. We have identified no trading activity that appeared to be erroneous or contributed to the break in the cash equity market during this period. Moreover, no market participant in our markets reported that trades were executed in error nor did the CME Exchanges cancel ("bust") or re-price any transactions as a result of the activity on May 6th.

In the following sections, we discuss: (1) the functioning of our markets on May 6, 2010, (2) the market dynamics in the futures market vis a vis the equity market, and (3) the relevant applicable CME and NYSE circuit breaker rules and (4) CME electronic functionality, particularly CME Stop Price Logic functionality and price banding, among others, which serve to protect our markets. Finally, we have also included preliminary recommendations as to changes that could avoid a recurrence of this type of event in the future.

## **II. The CME Markets Functioned Properly on May 6, 2010**

### **a. CME Has Conducted an Initial Review of Detailed Trading Records**

CME Group analyzed trading volume and activity throughout May 6 and focused particularly on the activity taking place during the period of 1pm to 2pm Central Time. Total volume in the June E-mini S&P futures on May 6<sup>th</sup> was 5.7 million contracts, with approximately 1.6 million or 28% transacted during the period from 1pm to 2pm Central Time. During that hour, the market traded in a range of 1143.75 to 1056, or 87.75 points - beginning the hour at approximately 1142 and ending the hour at approximately 1113. More than 250 firms and 9,000 User IDs were active in the market during this period of time.

During most of that hour, the bid/ask spread was a tick wide (.25 points) and the market traded in a largely orderly manner despite the significant sell off and subsequent rally. At approximately 1:45:28, following a sharp 12.75 point decline over a period of approximately 500 milliseconds on the sale of 1100 contracts by multiple market participants, the bid/ask spread momentarily widened to 6.5 points or 26 ticks.

At that point, one of CME Globex's risk management functionalities, a CME Globex Stop Price Logic event, which is discussed in more detail below, was triggered. As a result, the market was automatically paused for five seconds to allow liquidity to come into the market. The market subsequently reopened and was 1056.50 bid, at 1056.75 offered, and thereafter rallied more than 40 points to 1097 in the following three minutes and confirmed its upward recovery.

The Market Regulation Department reviewed a significant amount of activity during this period, a period that included more than 3 million system messages, and, in particular, reviewed the activity of entities whose trading activity during the one-hour period was significant and thus warranted further review. Market Regulation staff ultimately concluded that there were no anomalies represented by the level of activity or the trading strategies employed by market participants.

### **b. CME Markets Provided an Important Price Discovery and Risk Transfer Function on May 6**

From a broader perspective, the cumulative record of May 6 trading activity underscores the fact that CME's futures markets, due to their high level of liquidity, provided an important price discovery and risk transfer mechanism for all market participants on that day.

The second-by-second trading range, which is an indicator of the liquidity in the market, shows that futures had much tighter bid-ask spreads than the comparable Exchange Traded Fund or ETF. The ETF which is most comparable to the E-mini S&P 500 futures is the SPDR S&P 500 ETF Trust (SPY). This demonstrates that, while all the markets were less liquid than in normal times, the liquidity in the futures market degraded much less than in the ETF markets (which, in turn, degraded much less than the individual stocks, especially stocks that are thinly traded.)

There is strong evidence that the futures market (E-mini S&P in particular) was much more liquid than the fragmented underlying stock market on May 6. During the period between 1:40 and 2:00 CST, the volume of E-mini S&P (notionally adjusted) was 3 to 4 times greater than the SPY volume and, at the peak of the market's volatility, was to 8 to 10 times greater.

The data does show that the E-mini S&P futures reached its low prior to when the stock market reaching its lows. This is consistent with the role of the futures market in anticipating market movements. Futures contracts, by design, provide an indication of the market's view of the value of the underlying stock index. Casual observation may lead to the conclusion that the E-mini S&P futures prices appeared to lead the decline in the cash market. The chart, attached as Exhibit A, illustrates the comparative value of the E-mini, traded on the futures market, as compared to the equities markets. The chart demonstrates that the E-mini S&P moved virtually in tandem with the comparable cash instrument until the moment when our Stop Price Logic was implemented which caused our matching engine to pause for 5 seconds. At the time the Stop Price Logic was implemented, the E-mini S&P ceased its drop, while the cash market continued its steep decline. The E-mini S&P then rallied significantly for the remainder of the trading session. We believe this recovery was positively influenced by our Stop Price Logic functionality which stabilized market activity. This functionality is not available in the securities market. Consequently, while the broad based index markets – SPYs and CME E-mini S&P – were substantially recovering, there were continued price declines in individual stocks which persisted for minutes (not seconds).

If a seller made a decision to sell a large position, it was rational for that seller to turn to the most liquid market, notably the E-mini S&P futures contract, where there is significant market participant confidence. A review of the composition of the trading volume confirms that this was the case. Consequently, equity index futures perform an important price discovery function in the market. If the futures market had not been available as an alternative, the selling would have manifested itself somewhere else, potentially in a less liquid market, such as the underlying stock market or the OTC derivatives market. The relative tightness of the spread in the futures market underscores the fact that there were buyers in the market as well creating a concentration of liquidity that further supported the important price discovery and risk transfer role of the futures market.

### **III. Circuit Breaker Rules**

One of the mechanisms that exchanges have implemented to curb market volatility are “circuit breaker” rules. Circuit breaker rules require an automatic halt in trading when pre-determined price levels are reached. CME Group Exchanges currently have circuit breaker rules in effect for equity index products which are consistent with the circuit breaker rules in the underlying equity

markets. The following is a brief history and summary of circuit breaker rules as developed by the equities markets and by CME.

Circuit breaker rules were originally introduced following the September 1987 market crash. The circuit breakers were implemented uniformly across all equities and options exchanges and were set at a fixed price level tied to the DJIA. If the DJIA declined 250 points (approximately 12% of the Index) from the prior day's close, a trading halt was imposed; if the DJIA declined 400 points, a subsequent two-hour trading halt was triggered. This rule was embodied in NYSE Rule 80B.

On October 27, 1997, the circuit breakers were triggered for the first time. A subsequent analysis of those events led to a modification of the circuit breaker rules to employ percentage declines of 10, 20 and 30% in the DJIA in lieu of the fixed point triggers previously used. That rule remains in effect.

The CME also adopted price limit rules for its equity index contracts. These price limits were coordinated with the NYSE Rule 80B trading halts when the latter were adopted in 1988. The price limit structure and levels have changed several times as the Exchange has gained more experience and as the trading halts in the equity market have been modified.

CME's rules originally included several intermediate price limits -- called "speed bumps" -- triggered prior to a trading halt, which were in effect for ten-minute intervals. CME also imposed total daily limits on its domestic equity futures contracts, set at approximately a ten percent drop in the respective index.

In 1998, when the circuit breaker rules at NYSE and the other equity exchanges were changed to the 10, 20 and 30% level, CME adopted a price limit system of 2.5, 5, 7.5 and 10% limits, with a total daily limit of 20%. Later in 1998, CME adopted a 15% speed bump which triggered a 10 minute reserve period in the market. In 2001, CME amended the price limits to eliminate the 2.5% limit on all domestic stock indexes. The limits were triggered at 5, 10, 15 and 20%.

In January 2008, the decision was made to harmonize CME's limits to be fully consistent with the NYSE Rule 80B (and also consistent with the methodology employed by the CBOT with respect to the DJIA futures). Consequently, the 5%, 7.5%, 10%, 15% and 20% limits were eliminated in favor of the 10%, 20% and 30% employed by the NYSE. CME did, however, retain the references to the specific stock index that is the subject of the futures contract rather than tying these limits to movements in the DJIA, meaning, for example, that the E-mini S&P 500 circuit breakers are tied to price movements in the related index.

CME implements an unconditional futures trading halt in the equity index futures when the primary stock market is halted, regardless of whether a particular index product has hit a limit or not. CME also continued enforcement of 5% limit bid or offer policy during overnight electronic trading hours; if equity index futures are locked limited at 8:15 a.m. Central Time ("CT") and remain so at 8:25 a.m. CT in the lead month futures contract, there will be a trading halt in effect until the commencement of regular trading hours (floor and electronic trading). During the trading halt, the Exchange will provide an Indicative Opening Price of the re-opening of trading on CME Globex, if applicable. If the lead month futures contract is no longer locked limit at

8:25 a.m. CT, trading will continue with the 5 percent limit in effect. At 8:30 a.m. CT, the 5 percent overnight electronic trading hours limit no longer will be applicable.

On May 6<sup>th</sup>, the declines in the DJIA were just short of 10% at a time of day when the 20% trigger was in effect. Consequently, the circuit breakers in the primary and the futures markets were not triggered.

#### **IV. CME Has Risk Management Controls to Mitigate the Potential for Disruption of its Markets**

In addition to the circuit breaker rules described above, CME has in place numerous risk management processes, procedures and systems to preserve the integrity of its market in light of the many risks associated with maintaining a primarily electronic market. For example, CME is the only exchange in the world that requires pre-execution credit controls. Appended to the testimony as Exhibit B is a detailed list and description of the multitude of controls that the CME employs on its CME Globex system, including credit controls, messaging volume controls and risk protection policies and procedures.

There are certain risk protection tools employed by the CME which are important to note individually and which are relevant to today's discussion. One of these tools, CME Globex Stop Price Logic functionality, was employed on May 6 – its operation and effect are also described below.

##### **a. Stop Price Logic Functionality**

The CME Globex system has a Stop Price Logic functionality which serves to mitigate artificial market spikes that can occur because of the continuous triggering, election and trading of stop orders due to insufficient liquidity. If elected stop orders would result in execution prices that exceed pre-defined thresholds, the market automatically enters a brief reserved state for a predetermined time period, generally ranging from 5 – 10 seconds. During this period, no orders are matched and new orders other than market orders may be entered and orders may be modified and cancelled. The momentary pause that occurs when Stop Price Logic is triggered allows market participants the opportunity to provide liquidity and allows the market to regain equilibrium, thereby mitigating the potential for disruptive market moves.

The stop spike price and time parameters in the E-mini S&P futures are 6 index points and 5 seconds, respectively.

The Stop Price Logic was triggered on May 6<sup>th</sup> in the E-mini S&P 500 equity index. At 1:45:27, one second prior to going into reserve state, the front month E-mini S&P 500 equity index futures contract was trading just under the 1070.00 level. Multiple parties entered the market selling and taking the market down to 1062.00. There was a stop order to sell 150 contracts at 1062.00 which moved the markets to 1058.25. This trade triggered another 150 lot stop at 1059.00 which sold the market down to 1056.00. At this time renewed buying from multiple firms absorbed the volume at which point, the market started to trade off of the lows.



The front month E-mini S&P 500 equity index futures market went into reserve state as a result of Stop Price Logic functionality being triggered at 13:45:28. The market came out of this reserve state five seconds later. As a result of the stop, the decline in the E-minis halted and the market came out of the reserve state with an initial price of 1056.75.

**b. Price Banding Functionality**

To ensure fair, stable and orderly markets, CME Globex subjects all orders to price verification using a process called price banding. The platform utilizes separate mechanisms for futures price banding and options price banding. Price banding prevents the entry of erroneous orders such as a limit bid at a price well above the market or a limit offer at prices well below the market which could trigger a sequence of market-moving trades that require subsequent cancellations.

**c. Protection Points for Market and Stop orders**

This CME Globex functionality automatically assigns a limit price (Protection Point) to futures market orders and stop orders to preclude the execution of these types of orders at extreme prices in situations where there is insufficient liquidity to support the execution of the order within an exchange-specified parameter of the current market.

The Protection Point values vary by product, and in the E-Mini S&P futures the Protection Point is established at 3 index points. The CME Globex system calculates the limit price for a Market Protected Order by applying the Protection Point value to the best bid or offer price (depending on the order's side of market) and by applying the Protection Point value to the trigger price for a Stop Protected Order. Any unmatched quantity remaining for a Market Protected or Stop Protected Order after it is executed to the Protection Point limit becomes a Limit Order at the limit price.

**d. Maximum Order Size Protection**

This CME Globex functionality prohibits entry of an order into the trading engine which exceeds a pre-determined quantity. For E-mini S&P 500 futures, the order size is 2,000 contracts. This functionality provides protection against the so-called "fat finger" trades. Additional credit controls serve as a check to ensure that a single market participant is not sending in continuous orders at the maximum order size if such trading cannot be supported.

**V. High Frequency Trading**

An important issue raised in this discussion is the contribution of high frequency traders ("HFTs") to the current situation and their future role in the markets. As recently described in the SEC's Concept release on market structure, high frequency trading was identified as one of the most significant market structure developments in recent years. Although HFT is not clearly defined, "it typically is used to refer to professional traders acting in a proprietary capacity that engage in strategies that generate a large number of trades on a daily basis."

CME believes that HFTs play an important role in the markets, particularly when such activities are engaged in with the types of risk management procedures detailed in the previous section.

HFTs are an important part of daily trading activity in the marketplace and this has developed in response to technological and trading strategy advances. This represents the natural evolution of technological advancements and improvements in the marketplace and the percentage of trading volume attributable to HFTs will likely continue to increase in the future. There is evidence that HFTs increase liquidity and transparency in the marketplace and narrow spreads which allows investors to buy and sell securities at better prices and at lower costs.

It is also important to note that not all HFTs are alike. A significant proportion of HFTs on the CME promote liquidity by providing continuous markets in our products. As illustrated by the events of May 6, in analyzing the role of one HFT, a majority of that entity's trading executed during the relevant one-hour period was related to that firm's market making activities. Thus, before considering restrictions on HFT activity, consideration should be given to the beneficial role played by HFTs in providing liquidity during normal market activity as well as during times of increased market turmoil.

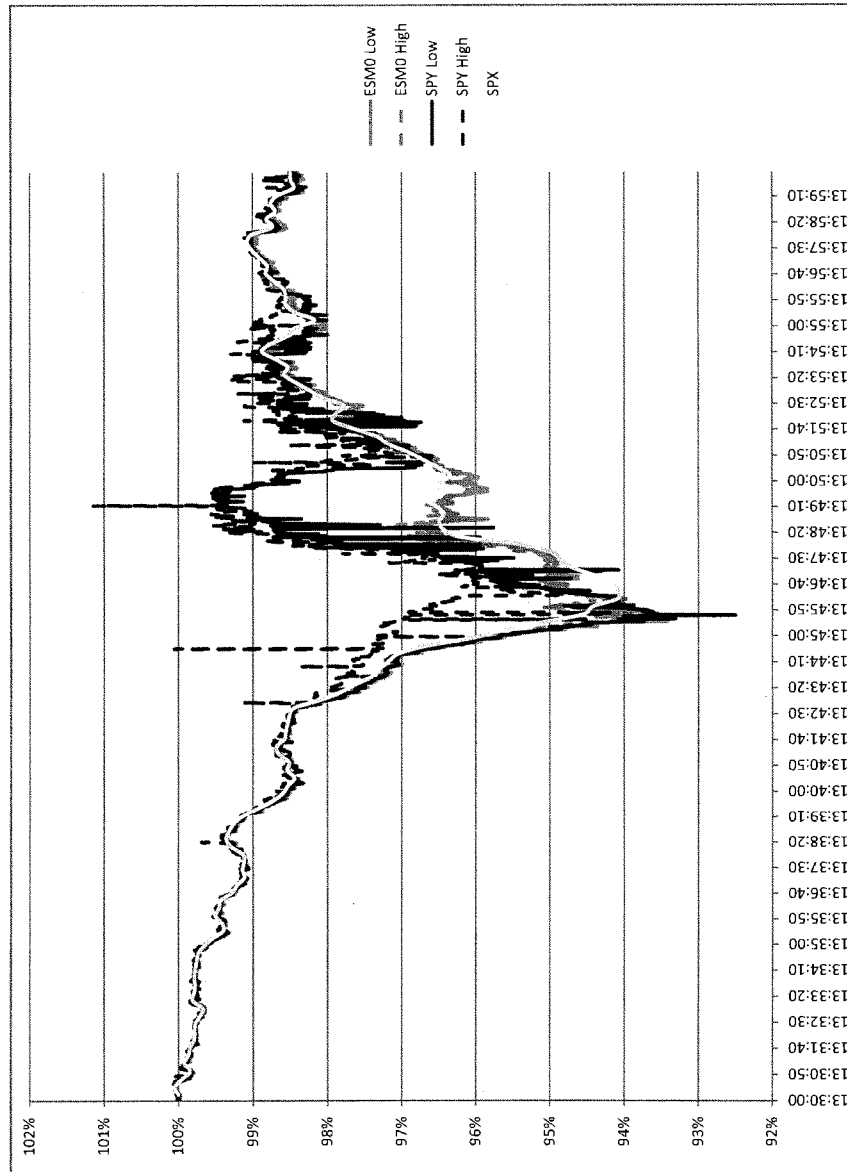
The use of high frequency trading by proprietary trading firms, investment banks, hedge funds and index traders, among others, has made the marketplace more efficient and competitive for all market participants. Careful consideration should be given to any decision to place significant restrictions or limitations on HFTs would be harmful to the marketplace and result in less efficient and less liquid markets. It is also important to note that automated trading or algorithmic trading has its origins in Europe. Accordingly, efforts to place limits or impose regulatory burdens on HFTs in the United States may encourage HFTs to shift the trading they currently conduct in the United States to Europe and other foreign jurisdictions that are already well-equipped to handle additional growth in both equities and futures.

CME Globex employs many risk management policies and procedures which assist in the mitigation of risk associated with any type of electronic trading, including that of HFTs. In addition, the CME Group Exchanges are proactive in monitoring the trading activity of HFT entities. All Automated Trading Systems ("ATS") using CME Globex are required to identify themselves as an "ATS" and register with the CME Group Exchanges. Subsequent to their registration, the CME Group Exchanges are able to monitor the trading activity of ATSs on both a real time and post-trade basis. CME has required ATS registration for its equity index products since 2006. This policy has now been expanded to ATS' for all products and we currently have over 10,000 ATS registered.

## **VI. Preliminary Recommendations**

As noted previously, CME has endeavored to extensively examine the activity in our markets on May 6, 2010. Based on our analysis to date, we would make the following preliminary recommendations regarding potential changes to improve the functioning of the markets during times of severe turmoil. Of course, as we continue to study the situation, we would be happy to contribute our further thoughts and recommendations.

- Circuit breakers, including circuit breakers for individual stocks such as that implemented by the NYSE, must be harmonized across markets. The lack of consistency exacerbated the decline in certain individual stocks as the NYSE exercised its Liquidity Replenishment Rule to slow down its markets and orders were then directed to less liquid electronic trading venues.
- Stop Price Logic functionality should be adopted across markets, on a product by product basis, to prevent cascading downward market movements.
- The current circuit breaker levels of 10, 20 and 30 percent, the duration of the halt and the time of day at which such triggers are applicable, should be reevaluated in light of current market conditions to determine whether any changes are warranted. Any such changes must be implemented across all market venues.



**Exhibit B****CME Group Inc. – Risk Management and Risk Protection Controls**

The following is an outline of the risk management services and applications and risk protection tools, policies and rules employed by CME Group.

**Risk Management Services and Applications**

The CME Group maintains several risk management applications and services to protect CME Globex customers and clearing firms.

**Globex Credit Controls:**

CME Globex Credit Controls provides pre-execution risk controls that enable Clearing Firm Risk Administrators to set credit limits through the CME Globex Credit Controls (GC<sup>2</sup>) tool. Clearing Firm Risk Administrators are able to define firm level trading limits and select real-time actions if those limits are exceeded, including:

- e-mail notification
- order blocking
- order cancellation

CME Globex Credit Controls functionality is available in both Manual and Automated modes.

**Manual Mode**

- Enables risk administrators to maintain manual credit control limits by setting a maximum order size and the capability to block new orders

**Automated Mode**

- Automated credit control management defined by Clearing Firm Risk Administrators
- View open and filled orders by executing firm
- Auto-cancel orders

**Drop Copy:**

The Drop Copy service allows customers to receive real-time copies of CME Globex Execution Report and Acknowledgement messages as they are sent over link order entry system sessions. Drop Copy aggregates link messages, enabling customers to aggregate positions and monitor orders for sessions guaranteed by one or more clearing firms upon approval of the clearing firms.

**Features:**

- Ability to monitor orders and activity
- Aggregated execution and reject messages

Cancel on Disconnect:

Upon an ungraceful dropped CME Globex to link user connection, Cancel on Disconnect (COD) cancels all resting session/day futures and options orders for that session. Customers are responsible for re-entering any orders cancelled by COD.

Features:

- Opt-in, subscription-based
- Free service

CME Globex Messaging Volume Controls

- Latencies in CME Globex markets can be caused by customers sending messages at sustained, high frequencies. To protect all market participants from the negative effects of this extraordinary and excessive messaging, CME Group implemented automated controls at the link session level to monitor for excessive new order, order cancel and order cancel/replace messaging. If a link session exceeds the designated message per second (MPS) threshold over a rolling three second window, subsequent messaging will be rejected until the average MPS rate falls below the threshold.

Mass Quote Governor

- Mass Quote Governor limits the rate at which firms can submit mass quotes. Excessive mass quotes impact CME Group trading engines and result in excessive amounts of market data, which impacts the customer. Mass Quote Governor eases the bandwidth and processing constraints on CME Group and firms receiving market data. This allows CME Group to provide a more stable and reliable market
- Mass Quote Governor measures the number of quotes per second (QPS) for each Market Maker mass quote enabled iLink session. The QPS is measured during a CME Group defined time interval. If a firm exceeds their allotted QPS as measured over the defined time interval, subsequent mass quote messages are rejected during the next time interval.

Risk Protection Tools

The CME Globex electronic trading infrastructure incorporates several risk protection tools to provide added safeguards to customers and clearing firms.

Price Banding

- To ensure fair, stable and orderly markets, CME Globex subjects all orders to price verification using a process called price banding. The platform utilizes separate mechanisms for futures price banding and options price banding.

- Price banding prevents the entry of erroneous orders such as a limit bid at a price well above the market or a limit offer at prices well below the market which could trigger a sequence of market-moving trades that require subsequent cancellations.

#### Futures Price Banding

A Price Band Variation (PBV) is a static value that varies by product. It is symmetrically applied to both the upside (for bids) and downside (for offers) to determine the Price Band Variation Range (PBVR). The Banding Start Price (BSP) is a dynamically calculated value that determines the PBVR. The BSP uses market activity such as trades, best bid and offer, implied bid and offer or indicative opening price to ensure that the most current and relevant information is used to calculate the PBVR.

#### Enhanced Options Price Banding

Enhanced Options price banding is identical to futures price banding, with the following modifications. Based on market conditions, the reference price is set to the:

- Last Price of the option or spread;
- Theoretical Options Price (TOP), based on well established options pricing algorithms; or,
- Last Price in combination with the TOP, if practical.

The width of the price bands is determined by one of the following:

- A fixed PBV for the entire option series, identical to the current price banding practice;
- A dynamic PBV based on the delta of the option, as estimated by the TOP calculation; or,
- A dynamic PBV based on a percentage of the TOP, where the percentage is based on the delta of the option.

#### Stop Order Logic Functionality

- Stop Order Logic functionality helps to mitigate artificial market spikes that can occur because of the continuous triggering, election and trading of stop orders. On CME Globex, if elected stop orders would result in execution prices that exceed pre-defined thresholds, the market automatically enters a very brief reserved state. During this period, new orders are accepted but trades do not occur until the reserve state expires, thereby providing an opportunity for the market to regain equilibrium.

#### Protection Points for Market & Stop Orders

- Market and Stop Order protection points permit orders to be filled within a pre-defined range of prices without having to manually define a limit price. Any Remaining Quantity for a Market Protected or Stop Protected Order will become a Limit Order at the Limit Price Calculated by the Trading Engine.

#### Maximum Order Size Protection

Maximum order size protection is embedded CME Globex functionality that prohibits entry of an order into the trading engine which exceeds a pre-defined maximum quantity.

Market Maker Protections

Market Maker Protections (MMPs) are parameters set by the Market Maker to provide a degree of risk protection by limiting their quote execution exposure. MMPs are available exclusively to CME-registered Market Makers specifically using Globex Mass Quote functionality. MMP parameters are set specifically for each Mass Quote Session Identification (Mass Quote ID). When their defined protection values are met or are exceeded within a 15 second interval, the protections are triggered. The MMP functionality is supported for all premium traded options and volatility traded options. MMPs are not available for Futures Instruments.

CME Group Provided ApplicationsFirmSoft

- FirmSoft is an order management tool which provides real-time visibility and cancel functionality for working and filled orders, across multiple firm IDs, in the CME Globex order management database. Access to FirmSoft can be granted based on one or more Trader ID(s), session(s) and/or account numbers.
- FirmSoft provides important risk mitigation functionality during system failures.
- With FirmSoft, customers can view and cancel orders for iLink and EOS Trader.

FirmSoft users can view:

- Current order status
- Fill information, including partial fills and fills from mass quotes
- Net positions
- Cancel replace history
- CME Globex timestamps

If enabled, FirmSoft users can cancel:

- An individual order
- A group of orders
- All working orders and mass quotes

Front-End Clearing System (FEC)

The Front-End Clearing System (FEC) provides real-time trade position details. In addition, FEC gives a clearing member firm back office staff an integrated method for entering and processing a variety of trade data.

Risk Protection Policy and RulesAccessing CME Globex

- The CME Group Rule Book outlines certain requirements for gaining access to CME Globex, including the requirement that all connections to CME Globex must be



Error Trade Policy

- The following shall be applied to balance the adverse effects on market integrity of executing trades and publishing trade information inconsistent with prevailing market conditions while preserving legitimate expectations of trade certainty by market participants. This rule authorizes the Globex Control Center (“GCC”) to adjust trade prices or cancel (bust) trades when such action is necessary to mitigate market disrupting events caused by the improper or erroneous use of the electronic trading system or by system defects. Notwithstanding any other provisions of this rule, the GCC may adjust trade prices or bust any trade if the GCC determines that allowing the trade to stand as executed may have a material, adverse effect on the integrity of the market. Please refer to Rule 588 of the Rule Book for complete details of the CME Group Error Trade policy.

**General Rules and Requirements for Entering Orders on CME Globex**Automated Trading System (ATS)

- An ATS that does not require an individual to initiate or manually confirm the creation of a specific instruction must be assigned, and must transmit into CME Globex, a unique TAG 50 that identifies the person who operates, administers and/or monitors the ATS. If the ATS operator is responsible for multiple trading models, algorithms, programs, or systems which trade the same product, and which potentially could trade opposite one another, then each model, algorithm, program or system must be assigned a unique TAG 50. Any deviation from this requirement must be approved by CME Market Regulation before being implemented.
- Some trading entities have assigned groups of individuals that work together to operate and monitor ATSs. For example, a firm may have one person who adjusts pricing parameters, but others who continuously monitor positions or risk and make decisions as to trading size. In these team situations, the individuals may use a single TAG 50 subject to the approval of CME Market Regulation. When registration is required, these team TAG 50s must be properly registered. Team TAG 50s may only be used in true team situations. Entities may not bundle all their ATS operators under one TAG 50 if those operators primarily work independently or at different times of the day.
- When ATS spreading functionality is the primary source of order entry, or if there is a large amount of order traffic from the operator, then a separate TAG 50 must be assigned to distinguish the automated orders from the manual orders.

ATS TAG 50 Registration Requirements

- CME requires clearing members to register all ATS TAG 50s.
- The clearing firm must associate each ATS TAG 50 with the name of the person who is directly responsible for controlling the trading of the ATS, and must select the ATS attribute on the registration screen to indicate that the TAG 50 represents an ATS. Each ATS operator must provide accurate and up-to-date information to their clearing firm concerning ATS TAG 50s. The TAG 50 that is registered must exactly match the TAG 50 that is submitted on CME Globex orders entered through iLink connections.
- Clearing firms must ensure that all TAG 50s including ATS TAG 50s, which require registration, are appropriately registered and must correct any errors and make any necessary updates to TAG 50 registrations.
- For Team ATS registrations, all of the same information as individual registration is required including each person's designated role as part of the team. These roles include: Desk Manager/Head Trader, Trader, Risk Monitor, Trading Monitor, or Other. If there are changes to the Team over time, it is the responsibility of the trading entity and the clearing firm to ensure that those changes are promptly and accurately recorded.

CME Group Globex Messaging Policy

- The CME Globex Messaging Policy creates fair business guidelines by which customers are billed a surcharge for overly high message rates. This policy benefits all customers trading on CME Globex by discouraging excessive messaging abuses, which in turn helps to ensure that CME Globex maintains the responsiveness and reliability that our customers around-the world have come to expect from it when trading the CME Group electronic markets. Under the CME Globex Messaging Policy, each clearing member firm (active or in active clearing member firms that maintain relationships with CME Clearing) must not exceed product-specific benchmarks, individually tailored to the valid trading strategies of each market. CME Group calculates benchmarks based on a per-product Volume Ratio, defined as the number of messages submitted for each executed contract in a given product. If a clearing member firm exceeds a benchmark, they will be issued two notices within a rolling 30 business day period.

ATS Messaging

- ATSS are treated like any other market participant and are subject to the messaging policy which applies to all message flow.  
(The Exchange sponsors Market Maker programs which may not be subject to all ATS provisions.)

Implementing this volume control for new order and order cancel/replace messaging is designed to:

- Support valid trading activity.
- Prevent a malfunctioning trading system from impacting the markets.

**STATEMENT OF GARY GENSLER**  
**CHAIRMAN, COMMODITY FUTURES TRADING COMMISSION**  
**BEFORE THE**  
**HOUSE OF REPRESENTATIVES COMMITTEE ON FINANCIAL SERVICES**  
**SUBCOMMITTEE ON CAPITAL MARKETS, INSURANCE, AND GOVERNMENT**  
**SPONSORED ENTERPRISES**  
**May 11, 2010**

Good afternoon Chairman Kanjorski, Ranking Member Garrett and members of the Subcommittee. I thank you for inviting me to today's hearing on the unusual volatility in the capital markets last week. I also am pleased to testify alongside Securities and Exchange Commission Chairman Mary Schapiro. Staff of the Commodity Futures Trading Commission (CFTC) and SEC have been in constant communication since Thursday afternoon. We will continue to work closely together to review the events of last week and make joint recommendations to protect the integrity of our markets and the American public. This afternoon, I will focus my testimony primarily on issues related to the futures marketplace and allow Chairman Schapiro to address the securities markets.

**The Equity Index Futures Markets**

Before I turn to the events of last Thursday, I will discuss the makeup of the stock index futures markets. I will also address the market protection mechanisms in place for orders entered

into the electronic trading systems of the two U.S. futures exchanges where the highest-volume equity futures trade.

Stock index futures are derivatives contracts that trade on central exchanges. Much like a crude oil futures contract is based upon the price of crude oil, a stock index futures contract is based on the level of a broad based stock index. The stock index futures marketplace consists almost entirely of futures contracts based on four principal stock indices. Futures on many U.S. stock indices, including the S&P 500, the Nasdaq 100 and the Dow Jones Industrial Average, trade on the Chicago Mercantile Exchange (CME). Futures on other U.S. stock indices, including the Russell 2000 Index, trade on the IntercontinentalExchange, Inc. (ICE). The total outstanding notional value of the futures contracts on these indices is approximately \$360 billion. This compares to a total U.S. equity market value of approximately \$13 trillion.

By far the largest stock index futures contract is the E-Mini S&P 500 ("E-Mini") contract, which is a cash-settled contract based on the level of the S&P 500 Stock Index. E-Mini futures account for more than 80 percent of the notional value of U.S. stock index futures open interest. E-Mini futures trade on the CME Globex electronic trading system, which operates nearly 24 hours a day from Sunday evening to Friday afternoon.

#### **Electronic Futures Trading Market Protections**

Both CME Globex and the ICE trading systems have automatic safety features – termed “pre-trade risk management functionality” – to protect against errors in the entry of orders (such as “fat finger” errors) and extreme price swings. These features help ensure fair and orderly markets.

First, CME and ICE electronic trading systems both automatically reject orders priced outside a range of reasonability, also known as price bands. For instance, on the E-Mini contract, such band is 12 points – or approximately 1 percent – above and below the last executed trade. This prevents clearly erroneous orders from triggering a sequence of market-moving trades that later require cancellation.

Second, both CME and ICE have maximum order size limitations that prevent entry into the trading engine of an order that exceeds a predefined maximum quantity. In the E-Mini contract, for example, the maximum quantity is 2,000 contracts. With the S&P 500 Index at approximately 1,100 points as it was on May 6, two thousand E-Mini contracts would have a notional value of approximately \$110 million. The average transaction size in the E-Mini contract, however, tends to be six contracts, or approximately \$330,000.

Third, both CME and ICE have protections with regard to “stop loss” orders. Such orders are triggered if the market declines to a level pre-selected by the person entering the order. CME and ICE rules provide that when the market declines to the pre-selected stop level for such

order, the order becomes a limit order executable only down to a price within the range of reasonability (12 points) permitted by the system, instead of becoming a market order. Requiring that stop orders have a limit avoids the potential that such stop orders could be executed no matter how low the market goes. This requirement for all stop orders to convert to limit orders prevents, for example, any stop orders from being posted at a price unreasonably below the market, such as orders at a price of one cent.

Fourth, CME Globex has Stop Spike Functionality that protects against cascading stop orders – the domino effect of one stop order triggering others. Globex’s Stop Spike Functionality pauses trading for five to ten seconds – five seconds in the case of the E-Mini contract – when the trading engine recognizes that it has a series of resting stop orders that could lead to a cascade and move the market up or down beyond a specified amount. The pause allows new orders to enter the system to restore liquidity and balance to the order book. On May 6, the Stop Spike functionality occurred on two currency futures contracts and at a critical moment in the E-Mini contract.

#### **Preliminary Review**

One of the questions on everyone’s mind – and the topic of this hearing – is: “What happened on Thursday?” While the staffs of the CFTC and the SEC, with the cooperation of the

exchanges, continue to review the events of that day, I would like to share some preliminary observations. This review is ongoing, and there is much we have yet to learn.

CFTC staff, in coordination with the SEC and the exchanges, has been working around the clock since Thursday afternoon to collect, review and analyze essential data. The CFTC receives trade and position data on a daily basis from the regulated exchanges and intermediaries. We have been in direct and regular communication with the futures exchanges, and Commission staff has interviewed a number of the major market participants. Shortly after the markets closed on May 6, staff issued “special call” requests to the ten traders with the largest positions in the June 2010 S&P 500 E-Mini futures contract. Staff subsequently sent similar letters to additional traders. The letters request information on trader positions and all communications related to trading on May 5 and May 6.

Thursday, May 6th, started with turbulent skies as the market digested significant news and information. Many financial news outlets were reporting on the uncertainties emanating out of Europe. In this environment of uncertainty, market participants started to require higher premiums to bear risk as indicated by a number of measures. One leading measure, called the VIX index, earlier in the week between Monday and Wednesday rose 23.4 percent and on Thursday rose another 31.7 percent, reflecting increased uncertainty among market participants. From Wednesday to its highest point on Thursday, the VIX index rose 63.3 percent. Premiums were higher on credit default swaps on many European sovereign debt securities, including debt

of Greece, Portugal, Spain, Italy and Ireland. The broad U.S. equity market declined as the S&P fell nearly 2 percent from its previous day's close by 2 PM.

The stock index futures markets and other markets are intertwined, and market participants in the stock index futures markets look for price signals from many places. By early in the afternoon, market participants would have seen indicator lights starting to flash in a number of places. Though we do not now know how these individual events motivated traders, looking back now, here are some of the market changes that occurred in the 20-30 minutes running up to the decline. Futures market participants likely would have observed some of these things. Currency markets were volatile. Small capitalization equity securities began declining sharply some time after 2:00. In fact, by 2:24, there were already eight closed-end mutual funds that had declined by 50 percent or more since 2:00.

We understand from our meetings with exchanges that by around 2:30, the exchanges were finding that their order books were thinning out as the markets became less liquid, while at the same time some investors were executing hedging strategies to protect themselves against a market decline. In the few minutes before 2:40 pm, two exchanges, Nasdaq and BATS declared "self-help" with respect to the New York Stock Exchange (NYSE) Arca Equities, an electronic trading platform. Self-help permits one trading center to bypass the quotes of another trading center if the affected center repeatedly fails to respond to orders within a one-second time period.



Around 2:40 pm, a number of individual securities listed on NYSE went into slow mode. Our current understanding is that, over the next five minutes, more than 10 additional individual securities entered into slow mode. These slow modes, or “liquidity replenishment points,” occur to enable market participants to interact with quotes and orders manually to enhance liquidity and reduce volatility.

From 2:40 to 2:45:28, the E-Mini declined by 58.25 points, reaching an intraday low of 1,056 – a decline of 5.2 percent. From the CFTC’s preliminary review of detailed intraday trading records and special call information, we understand that between 2:42 and 2:45, some of the most active traders limited their trading activity in the E-Mini futures contract. At 2:45:28, the CME’s stop-spike mechanism’s 5-second pause took effect. Following that pause, the contract’s price began to move upward.

We will continue to review the May 6 events, and in particular how S&P futures traded in relation to the cash markets and to exchange traded funds keyed to the same index. One of the highest volume exchange traded funds is the SPDR<sup>1</sup>, which has a market capitalization of just less than \$100 billion. Preliminary findings from the exchanges indicate the SPDR, which tracks the S&P 500, and the E-Mini futures contract were highly converged until the E-Mini started to rebound and the SPDR continued to decline another percent. In fact, we also saw that some stocks in the S&P 500 dropped faster than either the futures or the SPDR, such as 3M, and that,

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<sup>1</sup> S&P 500 Depositary Receipt.

through the rally, the SPDR ETF was more volatile than the E-Mini. The S&P 500 and Nasdaq 100 cash indices reported their bottoms in the 2:46 minute.

By 2:49, the ETFs on the E-Mini, Dow Jones and S&P 500 had rebounded. By 2:50, the broad-based equity indices had recovered to near their 2:30 levels.

Through our review, we have learned that there were about 250 participants in the S&P E-Mini futures contract during the timeframe the market sold off. Of the 250, we have more closely focused our examination to date on the top ten largest longs and top ten shorts. The vast majority of these traders traded on both sides of the market, meaning they both bought and sold during that period – acting, essentially, as liquidity providers. One of these accounts was using the E-Mini contract to hedge and only entered orders to sell. That trader entered the market at around 2:32 and finished trading by around 2:51. The trader had a short futures position that represented on average nine percent of the volume traded during that period. The trader sold on the way down and continued to do so even as the price level recovered. This trader and others have executed hedging strategies of similar size previously.

Exchanges and market participants have stated their belief that it is unlikely that a “fat finger” mistake caused the heavy volatility of May 6. To date the CFTC staff review produced no evidence indicating that a “fat finger” was the catalyst.

Despite high volatility, the clearing and settlement for trading that took place on May 6 at CME and ICE US worked effectively and without incident, including the movement of funds that took place during the intra-day settlement cycle. The amount that the CME collected and paid to its clearing members as a result of the mark-to-market calculation for all CME contracts was slightly more than \$4 billion; the amount collected and paid by ICE US to its clearing members was approximately \$750 million. All margin calls were met on time, although there were no intra-day margin calls during the price spike. Clearing and settlement for trading that took place on CME and ICE US on Friday, May 7, 2010, also worked well.

#### **Review by the CFTC in Coordination with the SEC**

Since Thursday, the CFTC and the SEC have been actively coordinating efforts to review that day's unusual market activity. The agencies' market oversight and trading divisions have been in regular communication, exchanging insights, ideas and expertise.

This morning, the CFTC and SEC jointly announced the formation of a CFTC-SEC Advisory Committee on Emerging Regulatory Issues, which was proposed last fall as part of the SEC-CFTC Harmonization report. The Committee will take up as its first task a formal review of the events of last Thursday and make recommendations as appropriate. The Joint Advisory Committee, made up of market practitioners, academics and former regulators, will begin meeting shortly and will issue its review as soon as possible. The staff of the CFTC and SEC

will provide to the Committee and Congress joint preliminary findings regarding last Thursday's market events on Monday.

#### **Next Steps**

Independent from Thursday's events, the CFTC currently is considering the implications of co-location and high-frequency trading. We also are considering a rule related to account identification so that the CFTC can collect better and more-detailed information on each trader in the futures markets.

Last Thursday's events remind us of the need for one of the critical components of financial reform: bringing transparency to the over-the-counter derivatives markets so that regulators can also see what occurred in those markets.

I thank you again for inviting me to testify today. I look forward to your questions.



**TESTIMONY OF  
LARRY LEIBOWITZ  
CHIEF OPERATING OFFICER  
NYSE EURONEXT**

**BEFORE THE  
HOUSE FINANCIAL SERVICES  
SUBCOMMITTEE ON CAPITAL MARKETS, INSURANCE,  
AND GOVERNMENT SPONSORED ENTERPRISES**

**MAY 11, 2010**

*Prepared Testimony of Larry Leibowitz, NYSE Euronext  
May 11, 2010*

### **Introduction**

Chairman Kanjorski, Ranking Member Garrett and Members of the Subcommittee, my name is Larry Leibowitz and I am Chief Operating Officer for NYSE Euronext<sup>1</sup>. I appreciate the opportunity to share with the Subcommittee our written testimony on the subject of today's hearing.

We commend the Subcommittee for its rapid response to the trading events of May 6, 2010. We agree with the Subcommittee that an orderly trading environment is fundamental to ensuring the reliability and integrity of our financial markets, fostering investor confidence in the markets, and safeguarding the U.S. financial system and economy. NYSE Euronext has always worked and will continue to strive to be the standard for accountability and transparency in the regulated marketplace. Thus, we believe it is essential to carefully examine the market events that occurred on May 6, 2010 and to consider potential market design and regulatory actions that could mitigate any similar occurrences in the future. NYSE Euronext is firmly committed to working with regulators and market participants toward achieving this critical objective. The trading events of May 6 are indicative of broader changes to markets and trading practices for which

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<sup>1</sup> NYSE Euronext is a leading global operator of financial markets and provider of innovative trading technologies. The company operates cash equities exchanges in five countries and derivatives exchanges in Europe and the United States, on which investors trade equities, futures, options, fixed-income and exchange-traded products. With more than 8,000 listed issues, NYSE Euronext's equities markets – the New York Stock Exchange, NYSE Euronext, NYSE Amex, and NYSE Arca – represent nearly 40 percent of the world's equities trading, the most liquidity of any global exchange group. NYSE Euronext also operates NYSE Liffe, the leading European derivatives business, and NYSE Liffe US, a new US futures exchange. We provide technology to more than a dozen cash and derivatives exchanges throughout the world. The company also offers comprehensive commercial technology, connectivity and market data products and services through NYSE Technologies.

*Prepared Testimony of Larry Leibowitz, NYSE Euronext  
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recent advances in technology have been a catalyst, and which the SEC wisely has opened for review.

Today I would like to discuss:

- the trading events of May 6, 2010;
- the actions, and rationale behind those actions, that the New York Stock Exchange took during those events; and
- our recommendations for market design and regulatory changes to avoid similar events and enhance investor safeguards in the future, including:
  - adopting coordinated circuit breakers to address extreme and rapid swings in the prices of individual stocks and revisiting the market-wide circuit breakers developed after the 1987 market break;
  - establishing uniform rules and procedures for cancelling trades; and
  - creating a consolidated audit trail of trading activity.

#### **The May 6, 2010 Market Drop**

On May 6, 2010, from 2:40 p.m. to 3:00 p.m. Eastern time, the U.S. equity trading markets experienced a precipitous decline. At its lowest point, the Dow Jones Industrial Average suffered an intraday decline of 998.5 points, representing approximately \$1 trillion in market value, with the most severe trading pressure occurring between 2:40 p.m. and 3:00 p.m. Some individual stocks lost nearly 100% of their market value. Although some of the underlying

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economic and global financial conditions that influenced this selling activity are known, the exact succession of events and what precipitated them remain unclear. The Securities and Exchange Commission (the "SEC") and the Commodity Future Trading Commission (the "CFTC") are aggregating and analyzing trading data from all of the equity and derivatives markets and will form a complete picture of the situation. We and other markets are working with the SEC and CFTC to supply and interpret this data, but we cannot do so on our own, as any single exchange has access only to the data from trades sent to or executed on that exchange.

Trading activity like we experienced on May 6 underscores the importance of the broad market structure review that the SEC is undertaking at present. As you know, in 2005 the SEC adopted Regulation NMS, which is the main set of regulations that govern the interaction of the competing markets in equity securities. Regulation NMS has resulted in a number of benefits to the equity markets, including narrower spreads and a greater use of technology, positioning the equity markets to handle the extreme market stresses that began in the fall of 2008.

Additionally, Regulation NMS resulted in vibrant competition in the markets. We strongly support competition in the equity markets, but competition among trading centers also has resulted in market fragmentation. There are currently upwards of 40 market centers in the equities markets, including registered exchanges and alternative trading systems. When a trading problem occurs, such as the May 6 experience, there is no central mechanism to



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coordinate a market-wide response. Exchanges have rules for trading halts regarding pending news and trading problems and also have rules to address erroneous trades. And the securities and futures exchanges, along with the Financial Industry Regulatory Authority, have adopted the market-wide circuit breakers developed after the 1987 market crash. However, there are no pre-established mechanisms to address precipitous declines on a stock-by-stock basis, or trading problems that result in market-wide drops of less than 10%.

The May 6 market drop certainly should inform the SEC's current examination of the changes in the markets, and in particular how certain recent advances in technology may have fostered trading practices that negatively impact the entire market. We are committed to working with the SEC and the CFTC as they consider these important issues. As regulators seek to determine whether regulatory action is necessary to address the shifts in market structure resulting from technological change, the events of May 6 make clear that the regulators also need to consider steps to avoid the types of extreme volatility our markets experienced that day. In this context, we believe it is worthwhile to explain the rules of the New York Stock Exchange that are designed to mitigate extreme volatility and how such rules could be used as a template for the broader market.

#### **The New York Stock Exchange's Market Model**

The New York Stock Exchange has embraced electronic trading, and its market model provides a combination of cutting edge technology with the best aspects of a floor-based market. Our rules are specifically designed to provide

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optimal price discovery and mitigate market volatility, and these rules automatically went into action on May 6. Specifically, the hybrid design of the New York Stock Exchange incorporated in its trading structure a type of circuit breaker mechanism, known as Liquidity Refreshment Points ("LRPs"), which temporarily requires stock trading to pause and reaggregate liquidity when significant price moves occur. The LRPs are triggered by specific criteria based on the prices of particular stocks, which criteria are included in our rule book and were approved by the SEC.

LRPs are designed to allow human intelligence to supplement artificial intelligence when trading appears irrational. The New York Stock Exchange's human liquidity providers absorb the news and trading patterns with respect to individual stocks and hold manual auctions of orders. To be clear, the LRP mechanism does not halt trading and it does not allow liquidity providers to step away from the market. Instead, on a brief basis, trading is paused to facilitate more accurate price discovery, mitigate confusion and reduce panic, and prevent the market from experiencing a sudden and significant drop. Our LRPs are analogous to taking the controls of a plane off auto-pilot during turbulence.

Necessarily, and beneficially, this process is more deliberate and time consuming than fully electronic trading. Although Regulation NMS permits electronic trading to ignore the New York Stock Exchange when we are in our circuit-breaker mode, many market participants specifically chose our mode of trading in this time of stress: during the 20-minute period of focus, including the periods when the New York Stock Exchange was in LRP mode on May 6, we

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executed volume commensurate with, and in many cases even higher than, our normal market share and we traded all orders that were routed to the New York Stock Exchange while the LRPs were in effect. A number of the LRPs in effect on May 6 were resolved in less than one second, and the average time of the LRPs was approximately 40 seconds. I emphasize these points to dispute the notion that NYSE stepped away from the marketplace during this crisis.

We should note that LRPs are not intended to prevent the market from falling; indeed that is not the role of an exchange, and could not be achieved by any one market. Rather, our LRPs are designed to prevent a sudden downdraft on our market from creating panic that could thunder through the financial system. A circuit breaker on a single trading market, such as the New York Stock Exchange, is not able to staunch volatile and panicked trading on other markets especially if those markets choose not to participate in our circuit-breaker mechanisms.

Once the New York Stock Exchange's circuit breakers were triggered, prices on the New York Stock Exchange were dramatically different from prices on electronic exchanges that did not have in place a similar circuit breaker mechanism. Because the New York Stock Exchange had switched to LRPs, and because Regulation NMS allows traders to bypass us, orders were routed to electronic markets that had not mitigated the volatile price declines and which had limited amounts of liquidity on their books. In turn, a spasm of selling spread through the markets with little liquidity, and no opportunity for the markets to pause or human judgment to intervene.

*Prepared Testimony of Larry Leibowitz, NYSE Euronext  
May 11, 2010*

### **Recommendations**

One clear lesson of May 6 is that our markets need a predictable, pre-established, coordinated way to respond to extreme and rapid market volatility. We believe the LRP mechanism functioned well on May 6, and the principles inherent in the LRP mechanism should be extended across the markets. As a first step, we believe that regulators should require all exchanges and market centers to implement a coordinated mechanism to provide a pause before trading crashes through all available liquidity into a free fall. If circuit breakers have been triggered in a security, the resulting pause should apply to all trading in the security irrespective of the market on which trading takes place.

In this regard, we suggest that the SEC should consider amendments to the order protection rules under Regulation NMS. The original intent of the rule may have been to give automated markets the option of bypassing a market that was temporarily operating in a manual mode. In practice, however, the ability of markets to bypass a manual market by default resulted in a situation where markets effectively chose to ignore and trade around our quotes once our circuit breakers were triggered. We certainly are willing to discuss the specific parameters of our LRPs, but the events of May 6 have demonstrated that it is time to reconsider the ability of markets to trade through functioning quotes as a default matter. Moreover, we note that customers have the ability to specifically request, and many do, for their orders to be directed to the primary market. In addition, we believe that it may be prudent to revisit the levels of the market-wide

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circuit breakers, and consider tightening their levels given the rapidity with which significant market movements can occur.

Further, we believe that developing a workable market-wide process for declaring an ongoing trading halt or reopening trading, even in the most difficult of market conditions, is essential to this effort. Any such mechanism should recognize that in times of extreme stress and volatility, a degree of centralized price discovery may be beneficial for the markets. Thus, we would suggest that the process for reopening trading after a halt should be conducted by the principal listing market for the security, in consultation with the regulators. Similarly, the decision regarding an ongoing market wide trading halt should be made by the principal listing market, as is done now for market wide news pending halts. Of course, as with all regulatory actions, regulators should avoid creating an unfair burden on competition. The public rulemaking process allows for these and other concerns associated with implementing market wide circuit breakers to be aired and resolved. Ultimately, this may best be achieved by consolidating self-regulation in one securities self-regulator, which would require action by Congress.

There are other actions that the regulators could take to address trading activity similar to what the markets experienced on May 6. First, the rules regarding the cancellation of trades should be defined with greater specificity. On May 6, it was announced after markets closed that any trades executed at 60% above or below the last price at 2:40 p.m. would be cancelled. This action was not predictable and caused confusion in the markets. It was an

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unsatisfactory substitute for the lack of circuit breakers for individual securities. There should be clear rules that set thresholds and circumstances under which trades will be cancelled or adjusted, to correct errors rather than market-wide movements.

In addition, to facilitate a review of extraordinary trading events, there should be a consolidated audit trail that would allow regulators to easily review market-wide trade data. Having such a mechanism in place very likely would have aided the review of the May 6 events. We understand that the SEC is developing a proposal in this regard, and we are committed to working with them on this important initiative.

We also note that the SEC has recently proposed regulations that would govern the risk controls applicable to providers of market access, to provide more transparency to the equities markets more broadly, and more generally review the functioning of the equities markets, and we have expressed our support for many of these proposals. In order to both avoid similar trading events and to facilitate surveillance, there should be uniform standards across markets that govern the risk controls and procedures that market access providers are required to implement. In addition, the SEC has proposed rules to gather information from large traders. These proposals may address some of the problems associated with aggregating and reviewing trading activity.

*Prepared Testimony of Larry Leibowitz, NYSE Euronext  
May 11, 2010*

### **Conclusion**

The events of May 6, 2010 demonstrate that the markets would benefit from a comprehensive structural review of the rapid advances in technology and their effect on trading practices and market integrity. As you know, the SEC has already commenced such a review, issued several rule proposals and has indicated that other proposals are forthcoming. We are committed to working with the SEC in these initiatives. In addition, we applaud the SEC and the CFTC for working together to review the events that transpired on May 6 and to develop a coordinated solution to prevent a recurrence of those events. NYSE Euronext is committed to joining together with all parties to work constructively toward this critical objective.

Once again, thank you for the opportunity to appear before the Subcommittee. I would be happy to answer any questions you have.



*Testimony of Eric Noll  
Executive Vice President  
The NASDAQ OMX Group, Inc.*

*Before:*

*U.S. House of Representatives  
Committee Financial Services,  
Subcommittee on Capital Markets, Insurance,  
and Government Sponsored Enterprises*

*Tuesday, May 11, 2010*



*Testimony of Mr. Eric Noll  
U.S. House of Representatives  
Committee Financial Services,  
Subcommittee on Capital Markets, Insurance,  
and Government Sponsored Enterprises  
Tuesday, May 11, 2010*

Good afternoon Chairman Kanjorski and Ranking Member Garrett. Thank you for the opportunity to offer the perspective of the NASDAQ OMX Group, Inc. on the events of May 6<sup>th</sup> and what they suggest for future improvements in the U.S. equities markets. As Executive Vice President of NASDAQ's U.S. Transaction Services business, I have responsibility for all trading of equities and options on the NASDAQ Stock Market, as well as trading on NASDAQ's markets in Philadelphia and Boston, NASDAQ OMX PHLX and NASDAQ OMX BX.

NASDAQ understands the critical role and obligations of capital markets. We have been working closely with the Securities and Exchange Commission, the New York Stock Exchange, and other national securities exchanges to protect investors in the wake of the unusual trading events last Thursday. We met yesterday with Mary Schapiro and her staff to develop a coordinated strategy to combat market instability. We support the Commission's actions and we believe that existing market-wide circuit breakers can be improved quickly and effectively. NASDAQ and other markets are also acting jointly to assess the operation and rapid implementation of stock-by-stock circuit breakers. These changes will enhance the markets' ability to handle unusual trading events in the future.

NASDAQ is well qualified to assist the Commission at times of market stress. We are the world's largest exchange company. We list over 3,700 public companies, operate twenty-two markets and ten clearinghouses world-wide, provide technology to over 70 exchanges, clearing organizations and central securities depositories in over 50 countries, and regulate the trading and clearing of equities, options, commodities, and derivatives across the globe. We understand fully the role we play in serving and protecting millions of investors in the United States and around the world that rely on the safety and predictability of our markets to grow their savings and safeguard their futures.

Had I testified *last* Tuesday rather than today, I would have told you that the U.S. capital markets are the deepest, fairest, most effective markets in the world and a crown jewel in the U.S. economy. I would have told you that our cash equities markets have been and remain the economic engine of the world, allowing U.S. companies to raise trillions of dollars in capital and to spur new industries around the globe. I would have told you that cash equities markets functioned flawlessly and continuously during the financial meltdown of 2008 and 2009, unlike the credit and derivatives markets which failed.

Each of those statements remains as true today as it was last Tuesday. Our markets are strong, despite the seventeen minutes of unusual trading that occurred between 2:39 and 2:56p.m. on May 6<sup>th</sup>. In fact, the markets' rapid recovery from 2:46 and 2:56 that day

confirms the resilience and continued strength of our markets even under extraordinary strain. We have been studying and will continue to study the data and behaviors recorded on May 6<sup>th</sup>. We must learn the lessons that are available from that day and prevent a repeat of those events to the greatest extent possible.

Our analysis is complicated somewhat by the fact that last Thursday's trading events appear to have involved the trading of equities, options, and futures. As you may have heard from the earlier panel with Mary Schapiro and Gary Gensler, Chairman of the Commodities Futures Trading Commission, one factor in Thursday's events was unusually heavy trading of the "E-Mini June," a popular futures product that tracks the expected value of the S&P 500 Index for June 2010. Trading of the E-Mini future correlates closely with equities and options that also track the S&P 500 Index, such as the SPY Exchange Traded Fund, as well as individual stocks that comprise that index, such as Procter and Gamble.

To understand fully the events of May 6<sup>th</sup>, you have to understand the state of the markets heading into last week. Markets were nervous. Equity markets have experienced an unusually long and large upward price movement. From a market low below 1,300 on March 9, 2009, the NASDAQ composite index had risen steadily to 2,535 on April 26, 2010. Market analysts will tell you that following such gains of almost 100 percent, it is not unusual for markets to experience a price correction.

Markets were becoming increasingly volatile. NASDAQ monitors the CBOE Volatility Index or VIX, which measures the implied volatility of the S&P 500 expected over the next 30 days. From its inception in March 2004 through July 2007, the VIX generally measured below 20. The index rose during the financial crisis, reached a high of 89 on October 24, 2008, and then gradually declined throughout 2009 and early 2010. From February 26, 2010 through April 26, 2010, the VIX continuously stayed below 20, dropping below 16 on April 12<sup>th</sup> and April 20<sup>th</sup>. Volatility returned on April 27<sup>th</sup>, when the VIX once again broke above 20 and began rising steadily. By May 5<sup>th</sup> the VIX reached the upper 20s, and on May 6<sup>th</sup> and 7<sup>th</sup> it closed above 30.

This increased volatility is tied to the escalating financial crisis in Greece and the Eurozone. Although the turmoil in Greece has been percolating for several months, the potential harm seemed to sink in to U.S. markets only last week. Within the last two weeks credit ratings agencies lowered their rating of the sovereign debt of Greece, Spain and Portugal, roiling sovereign debt markets; the European Union and International Monetary Fund were working to fashion workable bailouts; and social tensions and violence escalated in Athens. The Euro has lost 15 percent of its value in the last six months, including seven percent in the last two weeks alone.

Against this backdrop, we arrive at a truly unique confluence of events at 2:35 p.m. on the afternoon of May 6<sup>th</sup>. First, the Dow Jones Industrial Average was already trading off 272 points for the day and 500 points in the last three days. Market conditions were already volatile.

Second, the Chicago Mercantile Exchange was beginning to experience unusual trading activity in the “E-Mini June” at the same time equities markets were experiencing heavy trading in highly correlated equities. As you can see in Figure 1, the E-Mini began experiencing heavy volumes and prices begin sinking rapidly at 2:42, just before equities prices sink rapidly. At 2:45:30, E-Mini trading becomes so volatile that the Chicago Mercantile Exchange triggered an automatic 5-second trading halt in E-Mini futures. The price of the E-Mini future immediately leveled off and began to climb rapidly. Equities followed that pattern shortly afterwards.

Third, the NYSE Arca Exchange began experiencing data communication issues that hindered the electronic linkages between it and NASDAQ, the BATS Exchange, and the Chicago Board Options Exchange. Under Regulation NMS, when a market is unable to communicate properly, other markets may stop sending orders to it because its liquidity is less unavailable. Figure 1 shows the period of time that linkages to NYSE Arca were disrupted.

Simultaneously, the NYSE began reporting multiple “Liquidity Replenishing Points” and “gap quotes” that impact the trading of individual stocks in the NYSE market. Under Regulation NMS, when the NYSE or any other market reports these conditions, other markets may stop routing orders to it.

This confluence of events caused a severe and rapid drop in the markets. From 2:39 to 2:47 p.m. the Dow dropped 723 points to 9869, its low for the day and down 995 points total from the prior close. From 2:47 to 2:56 the Dow recovered just as rapidly, rising 612 points from 9862 to 9974, down 387 points for the day. From 2:56 p.m. to the close the Dow rose another 45 points, ending the day down 342 points. Yesterday, the Dow rose 404 points.

The question we are here to answer is what exactly happened to equities markets from 2:39 to 2:56 p.m. on May 6<sup>th</sup>? As you know, the markets and market participants are subject to multiple layers of regulation; the Securities and Exchange Commission oversees trading and markets, including regular and special examinations of markets and market participants. NASDAQ and other markets have “collars” that limit the impact of individual market orders and circuit breakers that limit aggregate movement of market indices. During the key period, NASDAQ’s market order collar prevented the execution of 4,268,000 shares that were outside the collar limits. Members have obligations to have procedures, controls, and systems in place to limit aberrant trading and control risk. The Financial Industry Regulatory Authority, acting as NASDAQ’s agent, examines firms to ensure that those procedures, controls, and systems are in place and effective. Should these safeguards have prevented the rapid decline and recovery in the markets last Thursday? We have already begun to re-examine each of these safeguards in light of last week’s events.

From a systems standpoint, NASDAQ’s market operated continuously throughout the day and throughout the critical seven minutes. Each and every one of NASDAQ’s electronic systems functioned as designed and as intended. Its execution engine

functioned as designed. Its market data feeds functioned as designed. Its surveillance systems functioned as designed.

***What did NASDAQ See and Do?*** NASDAQ operates the most heavily monitored exchanges in the world. NASDAQ's MarketWatch and Trading Operations departments monitor our equities markets from 6:30 a.m. to 8:00 p.m. using sophisticated technology that looks for trading anomalies, market rumors and manipulations. These departments process 17,000 phone calls in the average month and MarketWatch reviews more than 50,000 issuer press releases in the average year.

At 2:23pm NASDAQ's automated surveillance systems began issuing alerts in multiple securities exhibiting unusual price movements. In response to the alerts, NASDAQ's regulatory staff in the MarketWatch and Trading Operations departments began reviewing trading activity. NASDAQ's MarketWatch group uses high speed technology to oversee trading in the NASDAQ equity venues. On average the MarketWatch's surveillance system processes 1.9 billion equity related messages a day. On May 6 there was a large spike in surveillance alerts generated that coincided with the largest drops in the Dow.

At 2:30 p.m. the Chicago Board Options Exchange issued a communication stating "The CBOE has declared Self Help against the NYSE/ARCA as of 1:30 CT. The NYSE/ARCA is out of NBBO and unavailable for linkage. All CBOE systems are running normally." Under SEC Rule 611 under Regulation NMS, CBOE's announcement signaled that CBOE had stopped attempting to trade with NYSE Arca pending renewed communication from that exchange

At 2:36:59 NASDAQ systems detected a data disruption at the NYSE Arca Exchange and NASDAQ also declared "Self Help" against that Exchange. At 2:42 p.m., NASDAQ published a "System Status" update on its member website stating "NASDAQ has declared Self Help against NYSE ARCA (ARCA) as/of 14:36:59 E.T. All NASDAQ systems are operating normally."

At 2:43 p.m. NASDAQ issued another System Status update stating that NASDAQ OMX BX had also declared Self Help against NYSE Arca as of 14:38:40. All NASDAQ systems were operating normally.

At 2:45:30, trading in E-Mini futures became so volatile and negative that the Chicago Mercantile Exchange triggered an automatic 5-second "lock" that limited the downward price movement of E-Mini futures trades. This price lock differs from a trading halt; trading continues but prices are constrained from declining beyond the lock limit price.

At 2:48 p.m., NASDAQ MarketWatch communicated with NYSE Arca's regulatory staff. NYSE Arca staff confirmed that they also had seen unusual trading activity. Neither market had received any communication from members regarding system malfunctions or errant orders that might have contributed to price movements.

At 2:49 p.m. The BATS Exchange declared Self-Help against the NYSE Arca Exchange.

At 3:00, NASDAQ staff opened an internal call including key NASDAQ personnel from multiple departments. NASDAQ uses this procedure where necessary to gather knowledge quickly and to respond effectively to unusual trading activity. The call lasted until nearly 1 a.m. the following morning.

At 3:16 p.m. NASDAQ took the lead and initiated a market-wide call for the entire national market system. The triggering of a market-wide call is designed to establish communication and ensure coordination among exchanges that trade the same securities. It has become a critical procedure for exchanges to manage events such as this that involve cross-market trading activity. At 3:56 p.m. observers from the SEC's MarketWatch and Trading and Markets staff joined the market-wide call initiated by NASDAQ.

At this point, NASDAQ began focusing communication on the identification and treatment of "clearly erroneous trades", those trades that might be broken or unwound as a result of the market events. NASDAQ issued the following System Status update on its website at 3:37 p.m. NASDAQ is currently working with other markets to review the broad market activity that occurred between 2PM and 3PM today. NASDAQ will advise when more information is known."

At approximately 4:00 p.m. the markets jointly determined to review and potentially break trades that occurred between 2:40 and 3:00 p.m. The markets briefly considered breaking trades executed at 2:30 p.m. and after but they then decided collectively upon the 2:40 p.m. start time instead. This focused the exchanges on the core period. Trades outside this period were still eligible for review by individual exchanges under their own authority. At 4:24 p.m. NASDAQ issued another System Status update announcing the decision to review trades that occurred between 2:40 and 3:00 p.m.

After determining which trades to review, the markets continued to discuss which trades to break. There was significant debate among the exchanges regarding the proper break point for trades executed between 2:40 and 3:00 p.m. After extended discussion, the exchanges agreed on a joint market ruling to cancel trades during the review period that deviated by greater than 60 percent from the consolidated last sale price in that security at 14:40:00 or immediately prior. NASDAQ announced that decision to its members via a System Status update published at 6:03 p.m.

NASDAQ staff continued reviewing trades until after midnight on May 7<sup>th</sup>. NASDAQ regularly communicated rulings to its members by issuing System Status updates at 8:24 p.m., and 12:25 a.m. Additionally, at 8:28 p.m. NASDAQ issued a press release describing the market events and NASDAQ's decision to break trades made in conjunction with all other exchanges. It is important that trades be broken quickly, if at all, to avoid negative impact on clearing and settlement.

Ultimately, NASDAQ broke 10,468 trades representing 1,410,692 shares in 236 unique securities. Of the trades broken, 3,549 trades occurred between 2:40 and 2:47 p.m., and

6,919 trades occurred between 2:47 and 3:00 p.m. In other words, almost 65 percent of the broken trades occurred after the market began recovering at 2:46:30. Of the 236 securities affected, 20 were listed on NASDAQ and 216 were listed on NYSE or its NYSE Arca and NYSE Amex markets.

***Why Do The Markets Break Trades?*** Markets break executed trades when the price discovery process ceases to function properly and trade prices cease to reflect a true market. For such circumstances, the SEC has approved uniform clearly erroneous rules across all U.S. cash equities markets giving the exchanges the self-regulatory authority to cancel clearly erroneous trades executed by their systems. The exchanges can review trades and exercise this authority on their own initiative in response to extraordinary market conditions, or, upon the timely request of a party to a particular trade(s). Trade-break authority exists to nullify trades that take place in market conditions where errors, be they human or technological, or other unanticipated events, preclude fair and proper price-discovery. The primary topic of the market-wide call was to determine whether the exchanges would coordinate their regulatory efforts to break trades that were considered “clearly erroneous.”

NASDAQ’s clearly erroneous trade policies strive to maximize consistency, transparency and finality regarding trade-break decisions. NASDAQ pioneered the use of standardized numerical parameters that seek to define how far a trade must deviate from previous transactions in order to be considered erroneous. By focusing on objective numerical criteria rather than subjective criteria, NASDAQ avoids even the appearance of bias in the trade break process. These standardized criteria have now been adopted by all U.S. exchanges. It is important to remember that every trade has two parties – generally one will be happy to break the trade and avoid a loss while the other will want to keep the trade and any gain he or she has made. Therefore, it is important that NASDAQ use its authority only where necessary.

One key component to NASDAQ’s approach to clearly erroneous trade processing is the belief that it is important, where possible, to allow transactions priced close to the inside market or other reference price to stand, even if the transactions directly resulted from a mistake or system error. This ensures that market participants have economic incentives to develop and maintain internal controls with a goal of preventing erroneous trading activity. NASDAQ refers market participants for investigation by the Financial Industry Regulatory Authority (“FINRA”) in its capacity as NASDAQ’s regulatory services provider in all circumstances where a firm’s erroneous trades raise questions as to the adequacy of the firm’s computer systems and internal controls.

***What Lessons Can We Learn From Trading On May 6<sup>th</sup>?***

NASDAQ’s preliminary analysis indicates that unusual trading activity on May 6<sup>th</sup> was triggered by a confluence of unusual events, including events outside the cash equities markets. Aggressive, nervous selling of S&P 500 futures migrated to trading of closely correlated cash equities. Cash equity markets then experienced several challenging conditions. NASDAQ systems functioned continuously and as designed; NASDAQ experienced no system malfunctions or aberrations. Preliminarily, NASDAQ has

detected no system malfunction or errant trade by a NASDAQ member interacting with the NASDAQ Stock Market. No NASDAQ member has identified to NASDAQ a system error or aberration within their own systems. NASDAQ continues to investigate Thursday's events, but has at present located no "smoking gun" that single-handedly caused or explains Thursday's events.

NASDAQ supports the rapid and holistic response by the Securities and Exchange Commission. We support the Commission's recommendation to update market-wide circuit breakers that limit large price changes. The proposed circuit breaker would automatically halt trading in all stocks and in all markets in measured stages. Trading will be halted for fifteen minutes when the Standard and Poors 500 Index declines by five percent; for one hour when the Index declines by 10 percent; and for the remainder of the trading day when the Index declines by 20 percent.

NASDAQ also supports the Commission's desire to explore cross-market single-stock trading halts. The important characteristics of such a halt would be consistency across all markets, initiation by the primary market, and an orderly resumption of trading via the primary market. NASDAQ also suggests a flexible approach that recognizes that stocks trade in different ways, rather than a one-size-fits-all approach that treats all stocks identically.

Finally, NASDAQ is exploring other ideas which may encourage high-quality and continuous quoting on all markets. Other options to consider which may reduce the number of events which arise in the first place are (1) requiring priced orders rather than market orders; (2) eliminating or limiting the practice of "stub quoting;" and (3) creating better incentives to provide liquidity during periods of market stress. NASDAQ has already been a leader in promoting more aggressive risk management controls for all orders entered into all market centers. NASDAQ has actively supported the Commission's proposal to improve regulation of all forms of market access that create systemic risk in our markets.

Thank you again for the opportunity to share our views. I am happy to respond to any questions you may have.

***EMBARGOED UNTIL DELIVERY***

**Testimony Concerning  
the Severe Market Disruption on May 6, 2010  
Mary L. Schapiro  
Chairman  
U.S. Securities and Exchange Commission  
Before the Subcommittee on Capital Markets, Insurance and Government  
Sponsored Enterprises of the United States House of Representatives Committee on  
Financial Services  
May 11, 2010**

**I. Introduction**

Chairman Kanjorski, Ranking Member Garrett, and Members of the Subcommittee:

I appreciate the opportunity to testify concerning the severe market disruption that occurred on May 6, 2010.<sup>1</sup> The sudden evaporation of meaningful prices for many major exchange-listed stocks in the middle of a trading day is unacceptable and clearly contrary to the vital policy objective of maintaining fair and orderly financial markets. This event directly impacted the many who traded in that interval and undermined confidence in the integrity of the financial markets.

My testimony first will summarize the events on May 6 using the best information that is available at this point. Next, it will give an overview of the current market structure for the U.S.-listed securities, including the national market system and Regulation NMS, the highly automated nature of trading in today's markets, and the market-wide circuit breakers and other individual market "time out" mechanisms designed to address difficult trading conditions. Finally, I will discuss various regulatory tools that need to be considered in determining how best to maintain fair and orderly financial markets and to prevent severe market disruptions in the future.

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<sup>1</sup> My testimony is on my own behalf, as Chairman of the SEC. The Commission has not voted on this testimony.



## II. Summary of Events on May 6, 2010

### A. Chronology of Trading

On Thursday May 6, the stock markets had spent much of the morning and early afternoon in moderately negative territory, with the Dow Jones Industrial Average (“DJIA”) declining 161 points, or approximately 1.5 percent, by 2:00 p.m. (ET). Concerns over the financial situation in Greece, uncertainty concerning elections in the United Kingdom, and an upcoming jobs report, among other things, hung over the market. Shortly after 2:30 p.m., however, the market decline began to steepen and, by 2:42 p.m., the DJIA was at 10,445.84, representing a decline of approximately 3.9 percent. The DJIA then suddenly dropped an additional 573.27 points, representing an additional 5.49 percent decline, in just the next five minutes of trading, hitting 9,872.57 at 2:47 p.m., for a total drop of 9.16 percent from the previous day’s close (which, as discussed below, was not sufficient to trigger a circuit breaker trading halt).

Our preliminary analysis shows that this precipitous decline in stocks (and the subsequent recovery) followed very closely the drop (and recovery) in the value of the E-mini S&P 500 future (which tracks the normal relationship between futures and stock prices for the broader market). Similar declines were seen in stock market indexes other than the DJIA, such as the S&P 500 Index. In addition, the CBOE Volatility Index (“VIX”), a widely followed measure of market volatility sometimes known as the “fear index,” climbed above 40, a level not reached in over a year.

As quickly as the market dropped, it suddenly and dramatically reversed itself, recovering 543 points in approximately a minute and a half, to 10,415.65. By 3:00 p.m., the total daily decline in the DJIA had been reduced to 463.05 points (4.26 percent). The DJIA ended the day at 10,520.32, down a total of 347.80, or 3.20 percent, from the prior day’s close. This represented a significant down day for the markets, but the closing numbers belied the market’s dramatic moves down and then up during approximately 20 minutes of trading in the mid-afternoon. In addition, as has been widely reported in the press, many individual securities experienced much larger swings in their trading activity. For example, two DJIA components – Procter & Gamble and 3M – experienced declines of approximately 37 percent and 21 percent, respectively. In addition, certain stocks were executed at absurdly low prices, such as one stock which opened above \$40, was traded at one point at a penny, and then closed the day above \$40. The charts in Appendix A illustrate the volatility of this activity.

In addition, a large number of registered investment companies known as Exchange Traded Funds (“ETFs”) traded for short periods of time with massive intraday price swings. The shares of more than 25 percent of all ETFs experienced temporary price declines of more than 50 percent from their 2 p.m. market prices. One large ETF sponsor reported to us that 14 of its domestic stock ETFs experienced executions of \$.15 or less per share (including five ETFs that had executions of one cent or less) while also observing that its domestic bond and international ETFs appeared to execute at reasonable prices. We are continuing to examine information about bond and

international ETFs against the broader market of ETFs. Of the domestic equity ETFs affected, however, the impact appeared not to discriminate among asset categories or investment objectives.

#### **B. Cancellation of Clearly Erroneous Trades**

As the markets closed on May 6, officials from each of the equity markets, pursuant to exchange rules, worked out a common standard to cancel trades that were effected at prices that were sharply divergent from prevailing market prices (so-called “clearly erroneous” trades). The exchanges determined to cancel any trades effected from 2:40 p.m. to 3:00 p.m. at prices 60 percent away from the last trade at or before 2:40 p.m. We understand that transactions in 286 different equity securities were canceled in this manner. In addition, on Friday May 7, several options exchanges similarly decided to cancel certain options trades from the afternoon of May 6.

A significant number of broken trades were in the shares of ETFs for reasons that are still unclear. These funds are hybrids – they are mutual funds that have shares that trade throughout the day like ordinary stocks. ETF sponsors reported to us that, internally, they experienced no significant problems in managing the funds last Thursday. Stability had returned to the market by the 4 p.m. market close and, as a result, these funds were able to calculate their net asset values based on the market prices of the securities in their portfolios as required by our rules. From the viewpoint of the funds, they saw nothing out of the ordinary or unusual compared to any other day in computing their end-of-day net asset values.

#### **C. Evaluation of Trading**

The Commission is committed to understanding fully and exactly what occurred on the afternoon of May 6, and has been hard at work investigating and analyzing the events of that day. We believe it is critical to understand the causes and effects of this event so that we can work to ensure that it does not occur again. Throughout this time, the Commission and its staff have been in close and continuous contact with the CFTC and other federal agencies, as well as the larger national securities exchanges, FINRA, and clearing organizations. In addition, we have been in contact with a wide variety of market participants, including broker-dealers, proprietary trading firms, and asset managers. We have obtained extensive data from the exchanges and other market participants and are in the process of analyzing that data to ascertain the triggers and impacts of trading that day.

The Commission also has been in close contact with our foreign counterparts. Some of our counterparts have circuit breaker-like market intervention mechanisms linked to our own and others have market intervention mechanisms that halt trading on specific securities affected by unexpected market volatility. This coordination will continue as we seek information on specific trades or events that may have precipitated any problems.

At this point, our investigation is in the early stages, though we recognize the pressing need to move rapidly. The various regulatory authorities are making substantial progress in analyzing last Thursday's trading and sifting through the voluminous trading records involved (including more than 17 million trades in listed equities between 2 p.m. and 3 p.m. alone). We hope to be able to provide investors and the public with more information soon on the events that may have contributed to this volatility, but we should recognize that it will take time to fully analyze the data.<sup>2</sup> Although developments in the markets and in technology may help speed access to market data, they also greatly complicate our efforts to analyze the complex web of trading arrangements and market dynamics that have developed since 1987. For example, the key day in the 1987 Market Break Study involved a trading session processing a little over 600 million shares in NYSE stocks. Last Thursday, the markets processed 10.3 billion shares in NYSE stocks alone.

In addition, the interconnections among markets and among equity securities and derivatives have grown immensely more complex over the past few years. Orders in one stock directed to one market can now ricochet to other markets and trigger algorithmic executions in other stocks and derivatives in milliseconds. By contrast, in 1987, investigations could focus their attention on discrete transactions largely effected on only one or two markets.

Nevertheless, we are dedicating significant personnel and information technology resources to addressing the issue. Even as our investigation into this matter continues, we can provide some preliminary findings on the turbulent trading on May 6. At this point, we are unable to point to a single event which could be the sole cause. We can, however, address some common reports that have circulated about the events of May 6.

***"Fat Finger":*** There have been reports in the press about a "fat-finger" error where, it is hypothesized, an order of billions of shares was entered, rather than an intended order of millions of shares. While we cannot yet definitely rule that possibility out, neither our review nor reviews by the relevant exchanges and market participants have uncovered such an error.

***Proctor & Gamble:*** In addition, there have been reports that one or more exceptionally large orders in the stock of Proctor & Gamble may have preceded and helped to trigger the broader market decline. There does not appear to have been any prior unusual trading in Proctor & Gamble that would have triggered the broader market decline.

***E-Mini S&P 500 Future:*** Another focus has been the role of the E-mini S&P 500 future in leading the market decline and recovery. To a great extent, this concern merely reflects a basic fact of market dynamics – much of the price discovery for the broader stock market occurs in the futures markets. Those who believe that the broader

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<sup>2</sup> When regulators and the markets sought to analyze the extraordinary volatility in the October 1987 Market Break, it required several months to identify key elements of that event.

market is overpriced (or underpriced) often will first sell (buy) futures for a broad market index rather than sell (buy) the individual stocks that make up that index. Moreover, many arbitrage traders study the relationship between futures prices and stocks prices. If they see a decline (rise) in the price of the futures compared to the price of the stocks, they will sell (buy) the underlying stocks in expectation that the stock prices quickly will follow the futures price. Indeed, this type of activity helps assure that stock prices will closely follow futures prices up or down.

Accordingly, given that the E-mini S&P 500 futures price fell by more than 5 percent in a few minutes and then quickly recovered all of the 5 percent decline, it should be no surprise that the broader stock market indexes showed similarly fast and similarly large declines and recoveries. It must be recognized, however, that the fact that stocks prices follow futures prices chronologically does not demonstrate what may have triggered the price movements. The triggering factor may have been an event in the futures market (such as an exceptionally large order), but it could have as readily been events or anomalous activities in individual stocks that caused someone to trade first in the futures markets.

**Hacker or Terrorist Activity:** At this time, we have not identified any information consistent with computer hacker or terrorist activity. I would also note that staff from our Enforcement Division are fully integrated in our review of the events of May 6 and will recommend appropriate action if they identify any activity that violates the securities laws.

Ultimately, we may learn that the extraordinary disruption in trading, however it may have been triggered, was the result of a confluence of events which, taken together, exacerbated what already had been a down day and led to an extraordinarily steep price drop and recovery. However, we are not prepared at this time to draw that conclusion. Of particular concern with respect to securities market structure is why many individual stocks were affected so much more than the broader market. We address some of these issues below.

#### 1. Absence of Professional Liquidity Providers

Most significantly, it appears that some professional liquidity providers<sup>3</sup> temporarily did not participate in the market on the buy side in many stocks that suffered particularly egregious price declines, whether because of an intentional decision to withdraw or because of specific market practices. Some types of professional liquidity providers have “affirmative” obligations to provide liquidity whether the market is up or down, as well as “negative” obligations not to take liquidity in ways that would destabilize the markets. Other professional liquidity providers do not have such

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<sup>3</sup> Professional liquidity providers are proprietary traders in the business of providing liquidity to the market, often through the submission of limit orders that rest on the electronic order books of exchanges and other trading venues. They include registered entities, such as exchange specialists and market makers, as well as unregistered proprietary trading firms that engage in passive market making and other types of trading strategies.

responsibilities, including some of the high frequency proprietary trading firms that also are discussed below. There is evidence that some firms that had previously been active participants in the markets withdrew their liquidity after prices declined rapidly. These firms may have acted appropriately under current rules, as a firm's risk models may have concluded that the action in the market presented too substantial a risk. As discussed below, however, we are looking at the data and considering the types of obligations that should apply to certain liquidity providers.

## 2. Disparate Exchange Practices

The decline in the market on May 6 also focused attention on disparate exchange practices for dealing with major price movements and other unusual trading conditions. One of these is the NYSE's mechanism for "liquidity replenishment points" ("LRPs"). The NYSE utilizes a hybrid floor/electronic trading model, unlike most other markets today which are fully electronic. There are disagreements regarding whether the one model performed better than another in these circumstances.

Although the ultimate answer to that question requires additional study and analysis, it is useful to describe the effect a certain feature of the NYSE had on market movements that day. In attempting to meld the traditional open-outcry floor-based auction model with today's technology, the NYSE's trading system utilizes what are known as "liquidity replenishment points," or LRPs. LRPs are best thought of as a "speed bump" and are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of sufficient size is reached. In such a case, trading on the NYSE in that stock will "go slow" and pause for a time period to allow the Designated Market Maker to solicit additional liquidity before returning to an automated market. This "speed bump" occurs even when there may be additional interest beyond the LRP price point.

On days of major market volatility such as May 6, stocks with significant and continual declines may frequently cause NYSE trading to go slow for many different stocks. Some have suggested that this practice caused a net loss of liquidity as orders were routed to other markets still offering automated executions. Others believe that the LRP mechanism served to attract additional liquidity that helped soak up some of the excess selling interest. We are focusing on whether the disparity in exchange practices can be addressed to promote more consistency in how orders are handled in the context of rapidly changing prices without undermining the benefits of individual market practices.

Another disparate exchange practice that occurred on May 6 is the use by certain exchanges of the "self-help" mechanism under Regulation NMS. When an exchange believes that another exchange is experiencing systems problems, the "trade-through" rule under Regulation NMS (described in section III below) permits the exchange to declare what is called "self-help" against the other exchange. This allows the exchange to exclude the quotations of the other exchange from its determination of whether the other exchange has a better "protected" price to which it must route orders for execution.

On the afternoon of May 6, just prior to the steep market decline, two stock exchanges declared self-help against another exchange, thereby excluding its quotations (and liquidity) from the two exchanges' routing tables. The excluded exchange has asserted that it did not experience systems problems that would warrant the declaration of self-help. We are investigating these issues and whether there needs to be greater consistency in exchange practices with respect to the self-help mechanism.

### 3. Other Factors

A variety of other factors likely contributed to or potentially exacerbated the events of May 6, but should not necessarily be considered problems that "caused" the severe market disruption. For example, many of the securities that were subject to trade cancellations were thinly-traded, including certain illiquid exchange-traded funds and preferred stocks. For such illiquid securities, a large order or influx of orders easily can soak up available liquidity across the market, resulting in an order, particularly if it is a market order, breaking through many price levels in an effort to obtain an execution at any price. A market order is an order to buy or sell a stock at the best available current price. Market orders do not require an execution at a specific price or price range. With market orders, the order submitted generally is assured an execution; however, there is no limit on what the execution price can be. This contrasts with limit orders, which are submitted with a specified limit price. Limit orders guard against executions at prices at which the order submitter is not willing to trade, though the trade-off is that the order may not be executed if the market suddenly moves away from the suggested limit price.

In addition, the effect of market orders on prices may have been further exacerbated on May 6 by the use of stop loss market orders. These orders turn into market orders when the stop price of the order is reached. When an investor places a stop loss market order, the investor is instructing the broker to sell a stock at the market if it falls to a certain price. In a normal market, where liquidity exists as the stock price goes up or down, this strategy can protect an investor from taking a major loss if the stock drops significantly by selling at a predetermined price to minimize the loss. However, on May 6, the use of market orders when stop loss orders were triggered may have led to automated selling that resulted in executions at aberrant prices.

Finally, the absurd result of valuable stocks being executed for a penny likely was attributable to the use of a practice called "stub quoting." When a market order is submitted for a stock, if available liquidity has already been taken out, the market order will seek the next available liquidity, regardless of price. When a market maker's liquidity has been exhausted, or if it is unwilling to provide liquidity, it may at that time submit what is called a stub quote – for example, an offer to buy a given stock at a penny. A stub quote is essentially a place holder quote because that quote would never – it is thought – be reached. When a market order is seeking liquidity and the only liquidity available is a penny-priced stub quote, the market order, by its terms, will execute against the stub quote. In this respect, automated trading systems will follow their coded logic regardless of outcome, while human involvement likely would have prevented these

orders from executing at absurd prices. As noted below, we are reviewing the practice of displaying stub quotes that are never intended to be executed.

#### **4. Initial Next Steps**

Given the unusual trading activity, the Commission is taking a number of steps to identify the causes and contributing factors, and to take near term and long terms steps to help prevent a recurrence.

Yesterday, I met here in Washington with the leaders of six markets - New York Stock Exchange, NASDAQ Stock Market, BATS Exchange, Direct Edge ECN, International Securities Exchange, and Chicago Board Options Exchange - and the Financial Industry Regulatory Authority ("FINRA"), to discuss the causes of Thursday's market events, the potential contributing factors, and possible market reforms. The meeting was productive and collaborative, and there was a strong consensus that the type of aberrational volatility experienced on May 6 is not appropriate in our markets. At the meeting, we agreed on a structural framework, to be refined over the next day, for strengthening circuit breakers and handling erroneous trades. There was an understanding that solutions must be implemented on a market-wide basis and that the standards applicable to circuit breakers and erroneous trades must be clear to all market participants.

Also, starting yesterday, Commission staff are on-site at all major markets to monitor trading conditions. In addition, at the Commission's request, FINRA has established an open phone line to facilitate open and immediate communications among the markets if issues arise. Commission staff will participate in these communications and remain at the ready to coordinate quickly with senior regulatory and industry officials to fashion a rapid response to a developing problem. These types of open conference lines have been utilized during periods of market volatility in the past, and serve to supplement existing intermarket messaging systems that have been in place since the October 1987 Market Break.

### **III. Overview of U.S. Securities Market Structure**

#### **A. The National Market System and Regulation NMS**

In Section 11A of the Securities Exchange Act of 1934 (added to the Act in 1975), Congress directed the Commission to facilitate the establishment of a national market system for securities in accordance with specified findings and objectives. Congress recognized that the securities markets are an important national asset that must be preserved and strengthened, and that new data processing and communications techniques create the opportunity for more efficient and effective market operations. It mandated a national market system composed of multiple competing markets that are linked through technology. A national market system should be contrasted with a structure in which trading is confined to a single trading venue, such as one particular

exchange. Congress determined that promoting competition among trading venues and giving as many market makers as possible an opportunity to provide liquidity in stocks would promote greater liquidity and price continuity than a single dominant trading venue.

Over the years, the Commission has sought to keep market structure rules up-to-date with continually changing economic conditions and technology advances. The most recent major updating of the national market system rules occurred in 2005, when the Commission adopted Regulation NMS. Regulation NMS addresses four areas: (1) a “trade-through” rule that prevents the execution of trades at prices that are inferior to a displayed and immediately accessible quotation on another trading venue; (2) an “access” rule that, among other things, promotes private linkages among market participants and trading venues; (3) a “sub-penny” rule that prohibits the display, ranking, or accepting of orders with sub-penny prices; and (4) amendments to the joint-industry plans for collecting and distributing consolidated market data to the public.

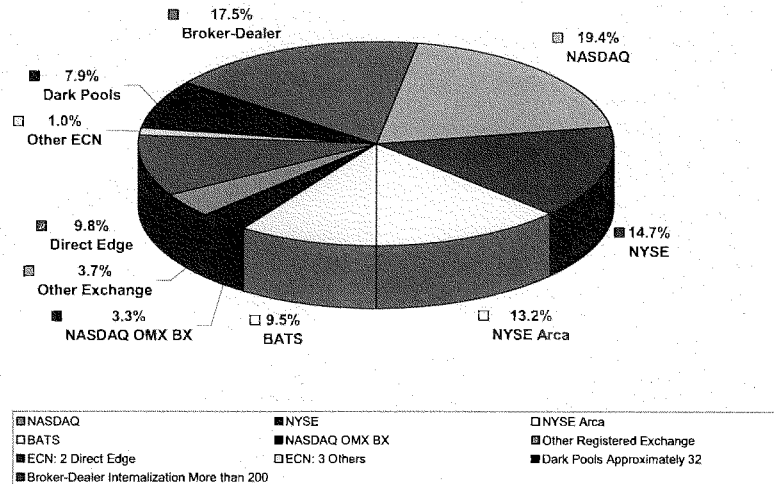
The trade-through rule is probably the most well-known aspect of Regulation NMS and arguably has affected the markets most significantly since it was adopted in 2005. The Regulation NMS trade-through rule eliminated a prior rule that benefited dominant exchanges with trading floors by protecting their manual quotations (that is, orders were required to be routed to the exchange in an attempt to access a manual quotation that could take as long as 10-20 seconds, rather than to another venue with an immediately accessible quotation at an inferior price). To compete under the new regulatory structure, all exchanges developed electronic systems that are capable of providing immediate responses to incoming orders and updating their quotations immediately. These systems enable the exchanges to display quotations that are protected against trade-throughs. Trade-through protection was designed to promote best execution and price stability by preventing one trading venue from ignoring the immediately accessible quotations of another trading venue in a downturn (as well as upturn). The trade-through rule does not protect a trading venue’s quotation if it is not immediately accessible, which, as discussed further below, is the case with the quotations displayed by the NYSE when it hits an LRP.

## **B. The Nature of Trading in the Current Market Structure**

At least partly as a result of Regulation NMS, trading in U.S.-listed stocks has changed dramatically in recent years. Trading volume now is dispersed among many different trading venues. For example, the share of the New York Stock Exchange in the trading in NYSE-listed stocks declined from 79.1 percent in 2005 to 25.1 percent in 2009. Nevertheless, more than 70 percent of volume continues to be executed by public trading venues that display quotations across a wide range of U.S.-listed stocks. Figure 1 below sets forth the major types of trading venues, along with estimates of their trading volume in September 2009;<sup>4</sup>

<sup>4</sup> Sources of estimated trading volume percentages: NASDAQ; NYSE Group; BATS; Direct Edge; data compiled from Forms ATS for 3d quarter 2009.



**Figure 1****Trading Centers and Estimated Percentage of Share Volume in NMS Stocks  
September 2009**

The exchanges and other trading venues have adopted highly automated trading systems that can offer extremely high-speed, or “low-latency,” order responses and executions. The average response times at some exchanges, for example, have been reduced to less than 1 millisecond. Many exchanges also offer individual data feeds that deliver information concerning their orders and trades directly to customers. To further increase speed in transmitting market data and order messages, many exchanges also offer co-location services that enable exchange customers to place their servers in close proximity to the exchange’s matching engine.

Highly automated trading systems have helped enable a business model for a new type of professional liquidity provider that is distinct from the more traditional exchange specialist and over-the-counter (“OTC”) market maker. In particular, proprietary traders now use high speed systems by submitting large numbers of orders that can result in more than 1 million trades per day by a single firm. These proprietary traders often are labeled as engaging in high-frequency trading (“HFT”), though the term does not have a settled definition and may encompass a variety of strategies in addition to passive market making.

HFT traders can be organized in a variety of ways, including as a proprietary trading firm (which may or may not be a registered broker-dealer and member of FINRA), as the proprietary trading desk of a multi-service broker-dealer, or as a hedge fund (all of which are referred to hereinafter collectively as a “proprietary firm”). Other characteristics often attributed to proprietary firms engaged in HFT are: (1) the use of extraordinarily high-speed and sophisticated computer programs for generating, routing, and executing orders; (2) use of co-location services and individual data feeds offered by exchanges and others to minimize network and other types of latencies; (3) very short time-frames for establishing and liquidating positions; (4) the submission of numerous orders that are cancelled shortly after submission; and (5) ending the trading day in as close to a flat position as possible (that is, not carrying significant, unhedged positions over-night). Given the competitive pressures to maximize their speed of trading, HFT firms typically will attempt to streamline the code for their trading algorithms. However, every check and filter in that code reduces its speed, creating a tension.

HFT is one of the most significant market structure developments in recent years. Estimates of HFT volume in the equity markets vary widely, though they often are 50 percent of total volume or higher. By any measure, HFT is a dominant component of the current market structure and is likely to affect nearly all aspects of its performance.

### **C. Intermarket Circuit Breakers and Time Out Mechanisms of Individual Trading Venues**

One aspect of the current market structure that pre-dates Regulation NMS is the intermarket circuit breakers that apply across all trading venues in the national market system. The only intermarket circuit breakers for stocks are established in NYSE Rule 80B, though all securities trading venues have agreed to halt trading in accordance with the provisions of NYSE Rule 80B. In addition, the futures markets have agreed to halt trading in equity securities-related futures in accordance with the provisions of NYSE Rule 80B.

Rule 80B establishes a very broad mechanism that is based on the 30 stocks of the DJIA. It is not currently triggered by the trading in any individual stock. The numerical triggers for NYSE Rule 80B last were updated in 1998 and apply at three levels of price decline – 10 percent, 20 percent, and 30 percent. The first triggering point is a 10 percent decline in the DJIA from its closing value on the previous trading day. If the decline occurs before 2:00 p.m. Eastern time, all trading venues will halt trading for one hour in all stocks, security options, and securities-related futures. If the decline occurs between 2:00 p.m. and 2:30 p.m., trading is halted for 30 minutes. If the 10 percent decline occurs after 2:30 p.m., trading is not halted unless a decline reaches the second level of 20 percent.

If a decline reaches 20 percent before 1:00 p.m., trading is halted for two hours. If it occurs between 1:00 p.m. and 2:00 p.m., trading is halted for one hour. If a 20 percent decline occurs after 2:00 p.m., trading is halted for the remainder of the day.

Finally, if a decline in the value of the DJIA reaches 30 percent at any time, trading is halted for the rest of the day.

Notably, none of the NYSE Rule 80B thresholds was triggered on May 6, despite the severe disruption in trading in many stocks. This issue is addressed below in the context of potential regulatory initiatives to prevent severe market disruptions in the future.

Separate and apart from the intermarket circuit breakers established in NYSE Rule 80B, trading venues can establish their own “time out” mechanisms designed to address significant price movements. These time out mechanisms can be more (but not less) restrictive than those in NYSE Rule 80B. An example of such a time out mechanism is the LRP mechanism established solely for the NYSE by its Rule 1000. The LRP mechanism applies at the level of individual stocks, and the thresholds for triggering the mechanism vary by type of stock. In general, however, an LRP is triggered by price declines in the range of 1-3 percent that occur within a 30-second time period. When triggered, the NYSE will display a “non-firm” quotation that cannot be accessed by incoming orders and therefore is not protected against trade-throughs by other trading venues. In the particular case of price declines, trading venues are entitled to trade at prices lower than the NYSE’s non-firm bid quotation during an LRP mechanism. During the LRP mechanism, the NYSE’s Designated Market Maker for a stock attempts to solicit additional liquidity before returning the NYSE to an automated market.

#### **D. Automated Trading and Severe Market Disruptions**

It is important to recognize that severe market disruptions in the form of precipitous price declines are not exclusively associated with automated trading. Disruptions are caused by a glut of sellers willing to trade at any price, combined with the near or total absence of buyers at a particular instant in time (who may themselves be influenced by the wave of sell orders crashing on the market). In these circumstances, prices can decline precipitously, as they did in many stocks on May 6.

Severe market disruptions have occurred throughout financial market history in a wide variety of market structures. For example, the U.S. equities markets declined by 22.6 percent on October 19, 1987 in a market structure that was dominated by a single manual trading venue. More recently, of course, and particularly since the implementation of Regulation NMS, the U.S.-listed equity markets have become much more automated and much faster. Nevertheless, they generally were able to continue operating smoothly even through the global financial crisis that reached a peak during the autumn of 2008. Accordingly, the inability of the equity markets to maintain fair and orderly trading in many stocks on May 6 is profoundly disappointing and troubling.

#### **IV. Potential Regulatory Responses**

To the extent there was anything positive in the events of May 6, it was that the markets proved to be resilient and recovered quickly. Nevertheless, such a severe market

disruption harms investors and the markets generally. First, it harms those investors who may have traded at erroneous prices. For example, many investors use stop loss orders that are triggered by significant price moves and can liquidate positions at very unfavorable prices. Other investors may see a precipitous price decline and initiate new orders to sell to minimize losses. These new orders likewise may liquidate positions at very unfavorable prices for the investor.

Some of these trades may be cancelled and some may not. But even for trades that are cancelled, they may cause losses for those investors and traders who stepped in and bought during the midst of a severe price decline. These investors and traders accepted the risk of a market meltdown and significant losses, but, if their trades are cancelled, were not rewarded for their willingness to buy when everyone else was selling. Finally and more generally, such disruptive price movements undermine the confidence of investors in the integrity and fairness of the securities markets. If investors lose such confidence, the securities markets will no longer be able to perform their essential function of supporting capital formation and the general economic welfare.

In response to the global economic crisis and evolving market practices, the Commission had already undertaken a number of initiatives to strengthen the integrity of our markets, even before the events of May 6. In February, for example, the Commission adopted a short sale circuit breaker. That rule is designed to limit short selling where an individual stock is under stress and has experienced a decline of 10 percent from the previous day's close. At that point, the restrictions of the rule provide assurances to investors that short sellers are not taking the stock down. In so doing, we believe that the rule will promote investor confidence.

The market events of last Thursday add greater urgency for the Commission to vigorously pursue a number of meaningful initiatives to promote investor confidence in the integrity and fairness of the securities markets, including a number of proposals already underway. I first will address additional initiatives relating to time out mechanisms, destabilizing short-term trading strategies, and correction of erroneous trades. I will conclude by noting various initiatives already proposed or soon to be considered that may help address disruptive market conditions.

#### **A. New Initiatives**

In January, the Commission published a concept release on equity market structure ("Market Structure Concept Release") that highlighted many aspects of today's highly automated markets and requested public comment on a wide variety of issues. The Market Structure Concept Release was designed to further the Commission's broad review of market structure to assess whether its rules have kept pace with, among other things, changes in trading technology and practices.

The events of May 6 implicate a number of issues raised in the Market Structure Concept Release. For example, it asked whether the current market structure appropriately minimizes the short-term volatility that can be so harmful to long-term

investors. It asked whether the relatively good performance of the market structure in 2008 indicated that systemic risk was appropriately minimized in the current market structure and, if not, what further steps the Commission should take to address systemic risk. Finally, it noted the dominant role of HFT firms in today's market structure and observed that they had largely replaced the role of specialists and market makers with affirmative and negative obligations for market quality. More specifically, the Market Structure Concept Release asked whether there is any evidence that proprietary firms increase or reduce the amount of liquidity provided to the market during times of stress. It also discussed various types of short-term trading strategies, including "directional" strategies, such as "momentum ignition," that could present serious problems in today's market structure by exacerbating short-term volatility.

The public comment period on the Market Structure Concept Release ended on April 21. The Commission has received more than 100 comment letters reflecting a broad range of perspectives. Many of the letters set forth detailed views on very complex issues, and the Commission continues to review them carefully. To follow up, the Commission intends to host a public roundtable in the next couple of weeks to probe more deeply into these market structure issues.

In addition, the Commission has published a series of concrete market structure proposals that are designed to strengthen the U.S. securities markets and to protect investors. These include the proposal to prohibit flash orders and the proposal to increase the transparency of "dark" pools of liquidity, as well as the market access proposal (discussed below) to strengthen broker-dealer risk management controls and the large trader reporting proposal (also discussed below) to enhance the Commission's surveillance and enforcement capabilities.

The events of May 6 demonstrate the urgency and importance of these efforts and provide a valuable concrete example of how the market structure performed under particularly stressful conditions. As such, they highlight particular regulatory steps that warrant close attention in the near future.

# **1. Time Out and Other Mechanisms to Maintain a Fair and Orderly Market**

Most significantly, we must consider what steps would help foster effective market making and liquidity, including during times of stress. The markets failed many investors on May 6, and I am committed to finding effective solutions in the very near term.

I believe that the full range of potential solutions must be on the table. In particular, we must consider the various types of "time out" mechanisms that can help maintain a fair and orderly market, both for the broad market and for individual stocks.

For example, we must ask whether the general, market-wide circuit breaker provisions that currently are on the books (none of which were triggered on May 6) need to be revised. I note that a vitally important element of the market-wide circuit breakers is that they apply across all stock and options trading venues and all venues for trading equity security-related futures, because markets for all equity security-related products are closely linked.

I believe that we also must consider the various types of time out mechanisms that can be applied to individual stocks. Although the prices of many stocks on May 6 declined in proportion with the broader market decline that occurred in securities and futures index products, the prices of many other individual stocks declined much, much more (before snapping back largely to the prices at which they were trading prior to the precipitous decline). At this point, the root cause of the sudden disappearance of liquidity in many stocks is unclear. One potential explanation is the inherent nature of algorithmic liquidity providers. In today's highly automated markets, proprietary trading firms provide much liquidity electronically through algorithms that are programmed to respond to events without human intervention. Such algorithms typically are developed by studying historical trading conditions and identifying patterns for profitable trading. Algorithms may be programmed to shut down trading when events no longer line up with the patterns that they are designed to exploit. Stated another way, algorithms may be very effective in adding liquidity in normal trading conditions, but may be inherently ineffective in adding liquidity when dealing with highly unusual events such as occurred on May 6.

Unlike pre-coded algorithms, people have the capacity, flexibility, and creativity to assess and respond to highly unusual events. Consequently, we must consider whether today's highly automated markets need additional time out mechanisms to deal with unusual events that may lead to a sudden loss of algorithmic liquidity sufficient to satisfy the demand for liquidity. For example, we are considering whether all trading venues in the national market system should be subject to a requirement to stop trading for a brief period of time on a stock-by-stock basis when prices move beyond normal trading patterns. The time period should be sufficiently long for traders to assess trading conditions (or to assess the operation of algorithms).

In addition to time out mechanisms, we will consider any other steps that potentially could prevent or help minimize the harm that occurred on May 6. These include: (1) exchange-level erroneous order filters; (2) "collars" on the prices at which market orders or aggressively priced limit orders can be executed; (3) limitations on the size of market orders or aggressively priced limit orders; and (4) eliminating the practice of displaying stub quotes that were never intended to be executed.

## **2. Destabilizing Short-Term Trading Strategies**

In addition to focusing on liquidity, we must also consider the sources of the selling pressure that can suddenly generate such enormous demand for liquidity to buy.

What triggered the selling pressure? What types of market participants were selling and what types of trading strategies were they pursuing?

For example, to what extent, if at all, did the wave of selling on May 6 come from proprietary firms employing “directional” strategies triggered by signals that attempt to exploit short-term price movements? These directional strategies were discussed in the Market Structure Concept Release and include “momentum ignition” strategies that are designed to start and exacerbate price movements. It is too early to know whether short-term professional trading strategies played any role in the events of May 6. If they contributed significantly to the precipitous decline, however, we must consider whether additional regulatory requirements are necessary to prevent such strategies from threatening the fairness and integrity of the markets.

For example, in the past, professional liquidity providers with the best and fastest access to the markets were charged with affirmative and negative obligations to promote market quality. One of the most significant negative obligations was a restriction on “reaching across the market” to take out quotations and thereby drive prices up or down. Many of the most active and sophisticated traders in today’s market structure are not subject to any obligations with respect to the nature of their trading. If active trading firms exploited their superior trading resources and significantly contributed to the severe price swings on May 6, we must consider whether regulatory action is needed to address the problem.

### **3. Fair and Consistent Process and Policies for Correcting Erroneous Trades**

We also must work with the various exchanges and other trading venues to assure that the process and policies for dealing with the correction of erroneous trades are fair for investors and consistently applied – both in the context of a single event and across different events. Currently, the threshold level for correcting trades is set by the exchanges on a case-by-case basis. The particular level that is chosen may affect investors and other market participants in profound and varying ways. Obviously, the primary objective should be a market structure that minimizes to the greatest extent possible any need to correct erroneous trades. When necessary, however, the process and policies should be applied in a consistent manner under established rules that are fair to investors.

#### **B. Ongoing Initiatives**

##### **1. Market Access Proposal**

In January, the Commission proposed a rule that would require effective risk management controls for broker-dealers with market access, including those providing customers sponsored access to the markets. Our proposal would effectively prohibit the growing practice by some broker-dealers of providing “unfiltered” sponsored access, where a customer is permitted to directly access the markets using the broker-dealer’s

market participant identifier but without the imposition of effective pre-trade risk management controls. All broker-dealers accessing the markets should implement controls to effectively manage the risks associated with this activity, and our proposal would unequivocally require them to do so. These risks include the potential breach of a credit or capital limit, the submission of erroneous orders as a result of computer malfunction or human error, and the failure to comply with regulatory requirements. Effective risk management controls for market access are necessary to protect the broker-dealer, the markets, the financial system, and ultimately investors. Such controls would help prevent trading activity that could trigger a severe market disruption. We have received numerous comment letters on our sponsored access proposal and the staff is considering those comments and will soon make a recommendation to the Commission. I expect the Commission to act on this important proposal by this summer.

## **2. Large Trader Reporting Proposal**

Last month, the Commission proposed to create a large trader reporting system that would enhance our ability to identify large market participants, collect information on their trades, and analyze their trading activity. To keep pace with rapid technological advances that have impacted trading strategies and the ways in which some market participants trade, the Commission must be able to readily identify large traders operating in the U.S. securities markets, and obtain basic identifying information on each large trader, its accounts, and its affiliates. In addition, to support its regulatory and enforcement activities, the Commission must have a mechanism to track efficiently and obtain promptly trading records on large trader activity.

The current system for collecting transaction data from registered broker-dealers is generally utilized in more narrowly-focused investigations involving trading in particular securities, and is not generally conducive to larger-scale market reconstructions and analyses involving numerous stocks during periods of peak trading volume. In addition, existing tools often require weeks or longer to compile trading data to identify potentially large traders. The Commission's need to develop the tools necessary to readily identify large traders and be able to evaluate their trading activity is heightened by the fact that large traders, including certain high-frequency traders, are playing an increasingly prominent role in the securities markets.

The proposed rule would enhance the Commission's ability to identify those "large trader" market participants that conduct a substantial amount of trading activity in U.S. securities, as measured by volume or market value. In addition, the proposal would facilitate the Commission's ability to obtain from broker-dealers records of large trader activity. By providing the Commission with prompt access to information about large traders and their trading activity, the proposed rule is intended to facilitate the Commission's efforts in reconstructing market activity and performing analyses of trading data, as well as assist in investigations of manipulative, abusive, and other illegal trading activity.



### 3. Consideration of Consolidated Audit Trail Proposal

One of the challenges we face in recreating the events of last Thursday is the reality that the technologies used for market oversight and surveillance have not kept pace with the technology and trading patterns of the rapidly evolving and expanding securities markets. There are mechanisms already in place to coordinate surveillance among markets. For example, the Intermarket Surveillance Group provides a framework for the sharing of information and the coordination of regulatory efforts among exchanges trading securities and related products to address potential intermarket manipulations and trading abuses. However, audit trail requirements vary between markets, resulting in a lack of current, readily accessible securities order and execution data. Today's fast, electronic, and interconnected markets demand a robust consolidated audit trail and execution tracking system.

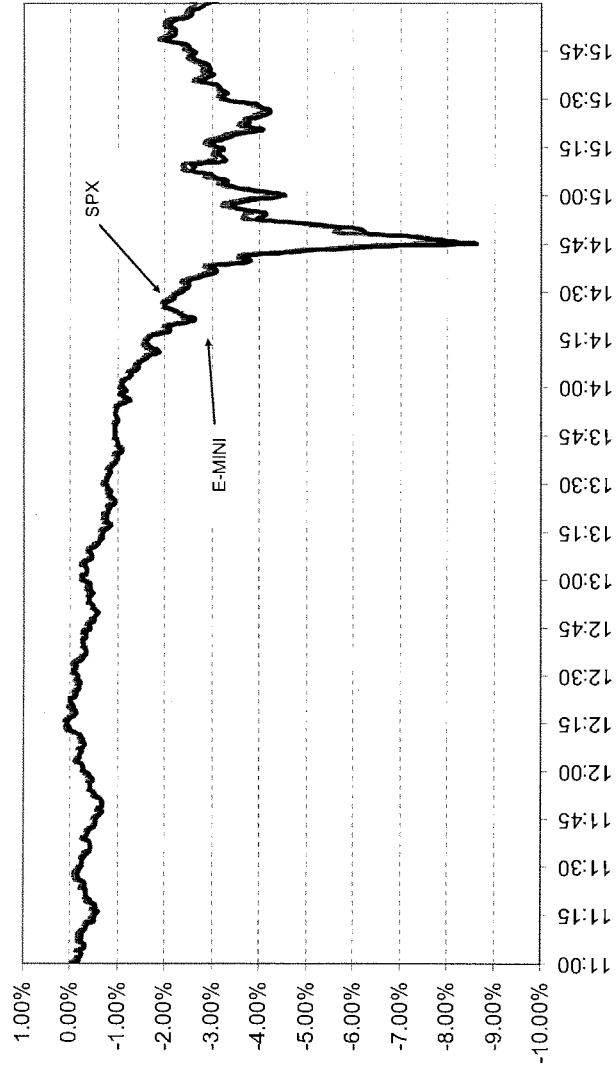
Since last summer, SEC staff have been working, in consultation with SROs and others, on a rule proposal that would require the SROs to jointly develop, implement and maintain a consolidated order tracking system, or consolidated audit trail. Within the next few weeks, I expect the Commission to consider this rule proposal, which should result in a continuous reporting mechanism for market participants that would capture the data needed for effective cross-market surveillance. The proposed changes will significantly improve the ability to conduct timely and accurate trading analyses for market reconstructions and complex investigations, as well as inspections and examinations. Indeed, I expect that the proposed consolidated audit trail would result in our ability to access in real time the majority of the data needed to reconstruct the type of market disruption that occurred last week, with remaining information available within a matter of days rather than weeks. A consolidated audit trail would be invaluable to enhance the ability to detect and monitor aberrant and illegal activity across multiple markets, and would greatly benefit investors and help to restore trust in the securities markets.

### V. Conclusion

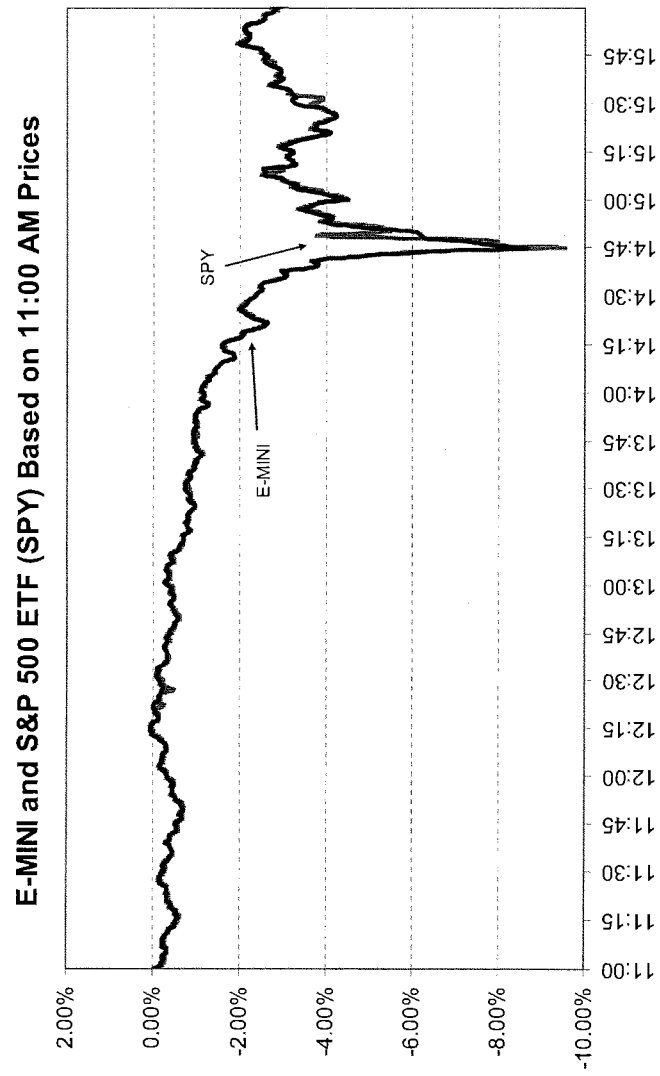
In conclusion, the events of last week are unacceptable. The SEC is engaging in a comprehensive review and will take necessary steps to implement additional safeguards to prevent the type of unusual trading activity that occurred briefly last week. The Commission is considering a number of proposals that will address key issues raised on May 6 and we will move expeditiously to address all issues we determine caused or contributed to those events.

## APPENDIX A

## E-MINI and S&amp;P 500 Index (SPX) Based on 11:00 AM Prices

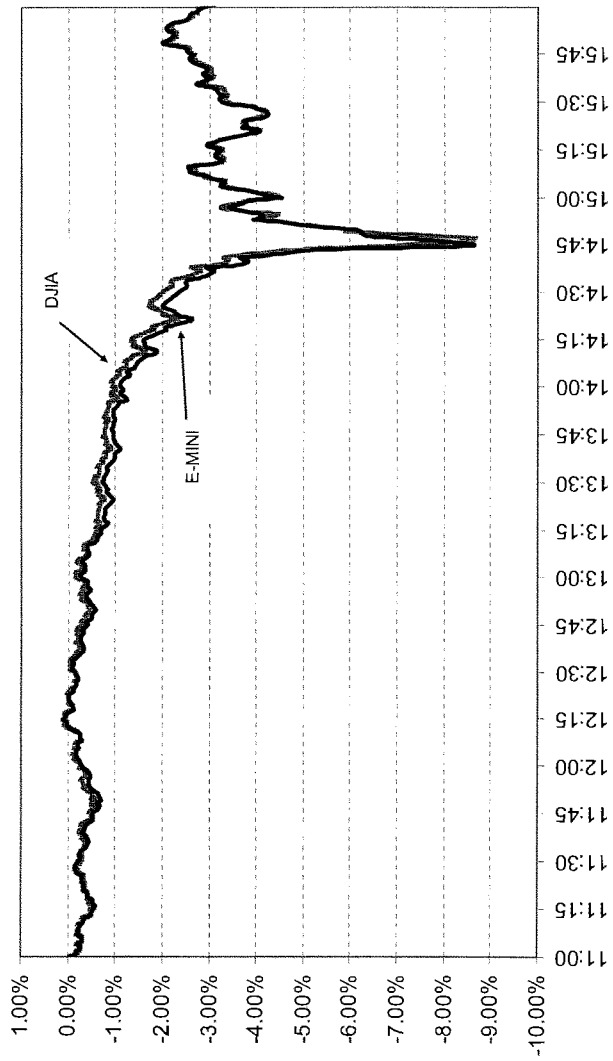


The chart above plots the E-MINI June Futures Contract (solid line) and the S&P 500 Calculated Index (light line). As shown, both plots closely track as might be expected since they are based on the same underlying stocks.  
 \*\* Data Source: Bloomberg.



The chart above plots the E-MINI June Futures Contract (solid line) and the traded S&P 500 ETF (SPY) Index (light line). As shown, both plots closely track most of the time, but the traded S&P ETF sometimes overshoots the E-MINI before quickly correcting.  
 \*\* Data Source: Bloomberg

Decline of E-MINI and DJIA Based on 11:00 AM Prices



The chart above plots the E-MINI June Futures Contract (solid line) and the Dow Jones Industrial Average Calculated Index (light line). As shown, the E-MINI tends to lead the decline and is first to reach its low before correcting. Note that the DJIA includes only 30 large stocks whereas the E-MINI is broad based and includes 500 stocks, suggesting that large stocks slightly lagged the broad market during the decline.

\*\* Data Source: Bloomberg.

**Statement of Commissioner Bart Chilton****Commodity Futures Trading Commission****Regarding the Market Events of May 6<sup>th</sup>**

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I commend CFTC Chairman Gensler, SEC Chairman Shapiro and Secretary Geithner for their tireless efforts (and those of their staffs) related to the serious and significant market events of May 6th. As we go forward, I am hopeful that we look at four areas of critical importance.

**1 – What Happened?** We need to figure out—immediately—specifically what happened. Regulators need to use every existing tool at their disposal, and get the answers. "We don't know," or "we aren't sure," is simply not acceptable. The CFTC and the SEC need to focus on this matter, with additional outside experts if need be, in a time-sensitive fashion. In that vein, I'm extremely pleased that we've set up a joint SEC/CFTC advisory committee to address issues such as this. Standard operating procedures should not apply. Indeed, the fact that we still do not have an answer to the question of "What happened?" highlights that we need to do more and have better oversight and enforcement tools. The regulatory reform bill making its way through Congress is critical in this regard.

**2 – Circuit Breakers.** Clearly, the fail-safe measures that were put in place were not safe—and failed. Circuit breakers—that is, systems that trigger a trading halt when certain market-related events occur—need to become mandatory and approved by regulators as appropriate for all markets and all contracts. These circuit breakers are currently voluntarily put in place by exchanges. Not only are such circuit breakers needed, they need to have ensured consistency and be set at appropriate levels, before serious and significant market anomalies take place. The fact that the circuit breakers were not triggered and that trades on some equity exchanges were busted, indicates a clear flaw in the current circuit breaker system.

**3 – OTC Authority.** Finding out what happened is, in part, made more difficult because oversight agencies don't have all the regulatory tools that we need to make swift, accurate, and thoughtful determinations about these markets. The over-the-counter (OTC) market is estimated to account for more than \$600 trillion in annual trading. By comparison, the regulated U.S. futures exchanges amount to less than

\$5 trillion. The OTC market is completely and utterly unregulated—a dark market—and it can have an impact on regulated trading. These markets are interrelated and interdependent. In brief, OTC markets can and do impact the prices consumers pay for just about everything they purchase (from a gallon of milk, orange juice, or gasoline to a home mortgage interest rate). Both the House and Senate regulatory reform measures would allow supervision of currently dark OTC markets. We need that authority, as President Obama has detailed numerous times, and soon as possible.

**4 – Financial Technology ("Fintech").** A decade ago, most exchange trading took place in trading pits. That has changed dramatically. Now, more than 80 percent of trading on regulated U.S. futures exchanges takes place electronically. The new and innovative trading practices that are currently in use (and being developed) have simply moved beyond regulators' ability to keep up with in a timely fashion. Algorithmic trading—where buy and sell orders are generated by computers making determinations by variable decision trees—are commonplace. Flash trading—which seeks to take momentary advantage of slight price changes by moving in and out of markets in large volumes and relying on computer speed gauged in nanoseconds—increases our global inter-connectedness not only in futures and equity markets, but markets all around the world. All of these factors are relatively new and regulators need to do more to ensure that fintech works for us or it will, as we have seen, work against us.

Whatever the impetus for the market aberrations on May 6th, there is no doubt that the collapse and ultimate rebound was affected—in some form or fashion—by fintech. This is evidenced by the sheer size and speed of the trading that moved markets so dramatically in such a short time period.

Fintech can be a great attribute to markets. It can make global trading accessible like never before, supply liquidity to markets and provide trading data trails for regulators and exchanges alike. Without fully understanding all of the ramifications of this technology however, we will continue to witness market aberrations. Perhaps there should be certain limits or parameters on fintech trading? Perhaps the size of trades should be regulated, or the time period in which they could occur should be limited or more closely monitored? These questions and many others need examination in detail, and urgently, by regulators, exchanges and policymakers.

May 6th was a serious and significant date in our markets—markets that consumers rely upon to ensure fair and equitable pricing. They are of national

importance. We need to continue to improve our regulatory regime in order to ensure that markets are efficient and effective and that they are devoid of fraud, abuse and manipulation.

Bart Chilton, Commissioner  
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cftc.gov

***Stop the Ponzimonium.  
Report financial frauds at 1-866-FON-CFTC (366-2382).***

**SECURITIES AND EXCHANGE COMMISSION**

[Release No. 33-9123; File No. 265-26]

**COMMODITY FUTURES TRADING COMMISSION**

**Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues**

**AGENCIES:** Securities and Exchange Commission (“SEC”) and Commodity Futures Trading Commission (“CFTC”) (each, an “Agency,” and collectively, “Agencies”).

**ACTION:** Notice of Federal Advisory Committee Establishment.

**SUMMARY:** The Chairmen of the SEC and CFTC, with the concurrence of the other SEC and CFTC Commissioners, respectively, intend to establish the Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues (the “Committee”).

**COMMENTS:**

Because the Agencies will jointly review all comments submitted, interested parties may send comments to either Agency and need not submit responses to both Agencies. Respondents are encouraged to use the title “Joint CFTC-SEC Advisory Committee” to facilitate the organization and distribution of comments between the Agencies. Interested parties are invited to submit responses to:

Securities and Exchange Commission: Written comments may be submitted by the following methods:

Electronic Comments

- Use the SEC’s Internet submission form (<http://www.sec.gov/rules/other.shtml>); or
- Send an email to [rule-comments@sec.gov](mailto:rule-comments@sec.gov).

Please include File No. 265-26 on the subject line.

Paper Comments



- Send paper comments in triplicate to Elizabeth M. Murphy, Secretary, Securities and Exchange Commission, 100 F St., NE, Washington 20549. All submissions should refer to File No. 265-26.

To help the SEC process and review your comments more efficiently, please use only one method. The SEC staff will post all comments on the SEC's Internet Web site (<http://www.sec.gov/rules/other.shtml>). Comments will also be available for Web site viewing and printing in the SEC's Public Reference Room, 100 F St., NE, Washington DC 20549, on official business days between the hours of 10:00 a.m. and 3:00 p.m. All comments received will be posted without change; we do not edit personal identifying information from your submissions. You should submit only information that you wish to make available publicly.

Commodity Futures Trading Commission:

- Written comments may be mailed to the Commodity Futures Trading Commission, Three Lafayette Centre, 1155 21st Street, N.W., Washington, DC 20581, attention Office of the Secretary; transmitted by facsimile to the CFTC at (202) 418-5521; or transmitted electronically to [Jointcommittee@cftc.gov](mailto:Jointcommittee@cftc.gov). Reference should be made to "Joint CFTC-SEC Advisory Committee."

**FOR FURTHER INFORMATION CONTACT:** Ronesha Butler, Special Counsel, at (202) 551-5629, Division of Trading and Markets, or Elizabeth M. Murphy, Committee Management Officer, at (202) 551-5400, Securities and Exchange Commission, 100 F St., NE, Washington DC 20549, or Martin White, Committee Management Officer, at (202) 418-5129, Commodity Futures Trading Commission, Three Lafayette Centre, 1155 21st Street, N.W., Washington, DC 20581.

**SUPPLEMENTARY INFORMATION:** In accordance with the requirements of the Federal Advisory Committee Act, 5 U.S.C. App. 2, the Agencies are publishing this notice that the Chairmen of the SEC and CFTC, with the concurrence of the other SEC and CFTC Commissioners, intend to establish the Committee. The Committee's objectives and scope of activities are to conduct public meetings, submit reports and recommendations to the CFTC and the SEC and otherwise to serve as a vehicle for discussion and communication on regulatory issues of mutual concern and their effect on the CFTC's and SEC's statutory responsibilities. Subjects to be addressed by the Committee will include, but will not be limited to, identification of emerging regulatory risks, assessment and quantification of the impact of such risks and their implications for investors and market participants, and to further the Agencies' efforts on regulatory harmonization. The committee will work to develop clear and specific goals toward identifying and addressing emerging regulatory risks, protecting investors and customers, and furthering regulatory harmonization, and to recommend processes and procedures for achieving and reporting on those goals.

To achieve the Committee's goals, the Chairmen of the SEC and CFTC will appoint approximately 10 - 15 members. There will be two co-designated federal officers of the committee. The Chairman of the CFTC will appoint a CFTC employee to serve as one co-designated federal officer of the committee and the Chairman of the SEC will appoint an SEC employee to serve as the other co-designated federal officer of the committee. The co-designated federal officers jointly call all of the advisory committee's and subcommittees' meetings, prepare and jointly approve all meeting agendas, adjourn any meeting when they jointly determine adjournment to be in the public interest, and chair meetings when directed to do so. The co-designated federal officers also will attend all committee and subcommittee meetings. The Chairmen of the CFTC and of the SEC shall serve as Co-Chairmen of the

Committee. The Committee's membership will be fairly balanced in terms of points of view represented and the functions to be performed.

The Committee's charter will be filed with the Senate Committee on Agriculture, Nutrition and Forestry; the House of Representatives Committee on Agriculture; the Senate Committee on Banking, Housing, and Urban Affairs; the House Committee on Financial Services, and U.S. General Services Administration Committee Management Secretariat ("Secretariat"). A copy of the charter also will be filed with the SEC, CFTC and the Library of Congress. The charter will be available for Web site viewing and printing in the Public Reference Room at the SEC's headquarters and posted on the SEC's Web site at [www.sec.gov](http://www.sec.gov) and the CFTC's Web site at [www.cftc.gov](http://www.cftc.gov).

The Committee will operate for two years from the date it is established unless, before the expiration of that time period, its charter is re-established or renewed in accordance with the Federal Advisory Committee Act or unless either the Chairman of the SEC or the Chairman of the CFTC determines that the Committee's continuance is no longer in the public interest.

The Committee will meet at such intervals as are necessary to carry out its functions. It is estimated that the meetings will occur six times per year. Meetings of subgroups or subcommittees of the full Committee may occur more frequently.

The charter will provide that the duties of the Committee are to be solely advisory. Each Agency alone will make any determinations of action to be taken and policy to be expressed with respect to matters within their respective authority as to which the Committee provides advice or makes recommendations.

The Chairmen of the Agencies affirm that the establishment of the Committee is necessary and in the public interest.

Pursuant to 41 CFR Section 102-3.65(b), the Secretariat has found good cause for approving the establishment of this advisory committee prior to the fifteenth day after publication of notice of establishment in the Federal Register so that the Committee members can quickly begin to identify emerging regulatory issues and their potential impact on investors and the securities markets. The Committee will lend the CFTC and SEC expertise that ranges across the securities and futures markets.

By the Securities and Exchange Commission.

Elizabeth M. Murphy  
Committee Management Officer

By the Commodity Futures Trading Commission.

Martin White  
Committee Management Officer

Dated: May 10, 2010

# QUESTIONS FROM REP. HINOJOSA

**It is important to note again that the Brady Commission concluded that the failure of stock markets and derivatives markets to operate in sync was the major factor behind factor behind the 1987 crash.**

**I have a multi pronged question for both of you:**

- I. Was market fragmentation a key cause of last week's 990 point drop in the Dow?**

ANSWER:

Market fragmentation can mean both:

- the ability to trade the exact same security on different venues, possibly subject to different rules, and
- the ability to trade different forms of the same security (via derivative contracts) on multiple venues each subject to different rules.

Although our review of the events of May 6 is ongoing, and both types of fragmentation add significant complexity to that task, certain aspects of fragmentation may indeed have played a role.

For example, individual stocks, index ETFs, stock options, and index futures contracts are examples of four different types of products that are all fundamentally linked via their exposure to equities. It is possible that the decline in prices of one type of product led to selling in another type of product. However, though these markets tend to rise and fall in tandem, it is not the case that changes in one always lead to corresponding changes in the other.

Also, as noted in the May 18, 2010 Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on Emerging Regulatory Issues ("Joint Staff Report"), we are examining the extent to which disparate practices among securities exchanges may have been a factor in the trading of certain stocks, including the execution of some trades at stub quotes as low as one penny. These disparate practices include NYSE's use of Liquidity Replenishment Points to slow trading in stocks with potentially significant volatility, as well as declarations of "self-help" by certain exchanges towards another to route around potential systems issues.

Even while the investigation into May 6 continues, the Commission has moved rapidly to address the extreme volatility of that day. On June 10, it approved self-regulatory organization rules that, for a pilot period, establish a set of circuit breakers that uniformly pause trading in a given security across all cash equity trading venues. The pilot initially applies to trading in S&P 500 stocks. The new rules will ensure that all markets pause simultaneously and provide time for buyers and sellers to trade at rational

prices. In addition, the Joint Staff Report emphasizes that a key issue for further action is to re-examine the market-wide circuit breaker provisions (i.e., those covering all of the futures and cash equities markets) to ensure that they continue to be effective in today's trading environment.

**II. Have any of the Brady Commission recommendations been put into effect?**

ANSWER:

The Brady Commission made five recommendations: (1) one agency should coordinate the few, but critical, regulatory issues which have an impact across the related market segments and throughout the financial system, (2) clearing systems should be unified across marketplaces to reduce risk, (3) margin should be made consistent across marketplaces to control speculation and financial leverage, (4) circuit breaker mechanisms (such as price limits and coordinated trade halts) should be formulated and implemented to protect the market system, and (5) information systems should be established to monitor transactions and conditions in related markets.

*One Agency*

The Brady Commission recommended that one agency be created to address intermarket issues. Although the SEC and CFTC have not been merged, the two agencies are working exceptionally well together today. In particular, I would note the work of our Joint Advisory Committee, which is investigating the causes of the May 6<sup>th</sup> market disruption, as well as last year's Joint Report on Harmonization of Regulation ("2009 Joint Report") that set forth 20 recommendations for the agencies to consider to further harmonize their oversight of the markets.

*Clearing*

The Brady Report noted that no clearinghouse at that time was able to accurately assess intermarket exposure among its clearing members and among their customers. This led to difficulty in developing proper collateralization practices and hampered lenders' ability to assess the credit risk of clearing participants. To address those issues, the Report recommended implementation of a unified clearing system that would clear stocks, stock index futures and stock options all through a single mechanism.

While unified clearing has not been implemented, intermarket cross-margining arrangements are now in use by some clearing agencies and derivatives clearing organizations to allow the clearing organizations to view positions of shared participants as a combined portfolio. Where implemented, these arrangements promote the Brady Report's overarching goal of improving intermarket credit risk and collateralization practices related to clearing participants.

In addition, the Securities Clearing Group was created in 1988 to formalize existing information sharing arrangements between securities clearing agencies and

included sharing of settlement, margin, and position information. In 1995, the futures clearing organizations joined this effort to share information among derivatives and securities clearing agencies and the Securities Clearing Group was renamed as the Unified Clearing Group. This intermarket sharing of clearing information advances the Brady Report's recommendation that clearinghouses be able to accurately assess intermarket exposure of participants.

#### *Margin*

In discussing the issue of margin requirements, the Brady Commission recommended that futures margins be consistent with effective stock margins for professional market participants, such as broker-dealers, and that cross-margining be implemented.

The SEC and CFTC have undertaken a number of efforts to address this issue. For example, in 2002 the SEC and the CFTC adopted rules to establish margin requirements for security futures. Under the final rules, margin requirements for security futures are identical whether those positions are held in a futures account or a securities account. Further, those rules require that the margin requirements for security futures be consistent with the margin requirements for comparable exchange-traded option contracts.

In order to more fully implement portfolio margining, the 2009 Joint Report included a section addressing differences between margin requirements in the securities market and futures market.

With respect to the level of risk that may be assumed by broker-dealers, in response to the October 1987 market break the SEC examined the specialist financial responsibility rules and financial surveillance systems of the various exchanges and noted several problems involving, among other things, limitations in the exchanges' systems of monitoring their specialists' securities positions and financial condition and inadequacies in the exchanges' specialist financial responsibility rules. The Commission concluded that the capital requirements then imposed by the exchanges on their specialists did not reflect the actual capital required to ensure the maintenance of fair and orderly markets in different types of securities. Based on those findings, the Commission amended its net capital rule for broker-dealers by making it applicable to all specialists, other than options market makers. Options market makers retained their exemption from the net capital rule provided certain conditions were satisfied, including a condition that their carrying firms continued to take applicable net capital charges for the market makers' options positions.

#### *Circuit Breakers*

The Brady Report also recommended a number of initiatives to address future periods of extreme market volatility, including the implementation of circuit breaker mechanisms coordinated across the markets for stocks, options, and stock index futures.

After the issuance of the Brady Report, the President's Working Group on Financial Markets ("Working Group") was formed with the mandate to determine the extent to which coordinated regulatory action was necessary to strengthen the nation's financial markets. In 1988, the Working Group recommended a number of initiatives to assist the markets in coping with future periods of extraordinary price swings and volume surges, including the adoption of circuit breakers that would provide coordinated trading halts and re-openings for large, rapid market declines that threaten to create panic conditions.

Partly in response to the October 1987 market break and the recommendations of the Brady Report and the Working Group, the securities and stock index futures markets submitted proposals to the SEC and CFTC in 1988 to implement circuit breakers that would impose temporary trading halts following significant market declines. The circuit breaker rules for the securities and stock index futures markets were implemented in October 1988.

The circuit breakers approved in 1988 provided for a one-hour trading halt in all securities markets if the DJIA declined 250 points from its previous day's closing level and for a subsequent two-hour trading halt if the DJIA declined 400 points from its previous day's close. In approving the original circuit breakers, the SEC and CFTC noted that the circuit breakers were not an attempt to prevent markets from reaching new price levels, but an effort by the securities and futures markets to arrive at a coordinated means to address potentially destabilizing market volatility along the lines of the historic decline of the October 1987 market break.

In July 1996, the agencies approved rule modifications to reduce the length of the trading halts by half. In addition, when the SEC and CFTC approved a six-month extension of the circuit breakers in October 1996, the agencies urged the markets to reach a consensus on the size of increases in the trigger levels required to ensure that cross-market trading halts would be imposed only during market declines of historic proportions. In response to the agencies' recommendations, the markets submitted proposals to increase the circuit breaker triggers to levels of 350 and 550 points in the DJIA.

On October 27, 1997, the nation's securities markets fell by a then-record absolute amount, with the DJIA declining 554.26 points (7.18 percent) to close at 7161.15. This was first and only day that the cross-market trading halt circuit breaker procedures were implemented. At 2:36 p.m., the DJIA had declined 350 points, thereby triggering a 30-minute halt on the stock, options, and index futures markets. After trading resumed at 3:06 p.m., prices fell rapidly to reach the 550-point circuit breaker level at 3:30 p.m., thereby ending the trading session 30 minutes prior to the normal stock market close.

Immediately following the events of October 27, the markets and regulators began considering further revisions to the circuit breaker procedures. There was general consensus that the 7 percent decline in the DJIA on October 27 did not justify the early



closure of the markets on that day. Accordingly, the SEC and the CFTC approved revised circuit breaker rules for the markets in April 1998. The revised rules established trading halts following one-day declines in the DJIA of 10 percent, 20 percent, and 30 percent. The NYSE would calculate the trigger levels at the beginning of each calendar quarter, using the average closing value of the DJIA for the previous month to establish specific point values for the quarter. These were the circuit breaker levels in place on May 6, 2010 and were not triggered when the DJIA had an intraday decline of 9.16%.

As noted in the May 2010 Joint Staff Report, the staffs of the SEC and CFTC intend to re-examine existing cross-market circuit breaker provisions to ensure they continue to be effective in today's fast paced electronic trading environment.

#### *Information Systems*

The Commission adopted Rule 17a-25 in June 2001, requiring firms to use the Electronic Blue Sheet (EBS) system to report stock-specific summary trading information to the SEC or SROs upon request.

The electronic-submission process under Rule 17a-25 is faster and more efficient than the old paper-submission process. But it did not materially improve the quality of the trading information, and typically requires weeks for the SEC or SROs to collect the relevant information. The EBS system simply was not designed to handle the massive amounts of trading that occurs in our markets today. Furthermore, no order-entry or execution times are provided in an EBS report, only aggregate buy, sell long, and sell short statistics. As a result, there are limitations on the ability of the SEC and the SROs to use EBS data to determine whether trading might be related to abusive or manipulative trading schemes.

On May 26, the Commission proposed a rule that ultimately would require the SROs to create and implement a consolidated audit trail that would enable regulators to track more complete information about orders and trades across the securities markets. The consolidated audit trail would be a standardized system that captures and reports information regarding the entry, routing, cancellation, modification and execution of all orders in national market system securities, across all markets. Each SRO, as well as the Commission, would have access to this information for purposes of performing its respective regulatory and oversight functions. This consolidated audit trail is designed to provide the type of detailed timed trading information that the Commission and the SROs would need to quickly identify trading patterns that, for example, might be exacerbating volatility or facilitating market manipulation. Such a system would enable the Commission staff and SROs to better carry out their oversight of the national market system for securities and to perform market analysis in a more timely fashion.

**III. Is the SEC-CFTC Advisory Committee similar in nature to the Brady Commission that investigated the October 19, 1987 market crash?**

ANSWER:

Several aspects of the Brady Commission differed from those of the Joint CFTC-SEC Advisory Committee.

*Scope*

The Brady Commission had a more narrowly focused scope than that of the Joint CFTC-SEC Advisory Committee. In essence, the Brady Commission was designed to focus its effort on one event – the October 1987 market break. The limited scope of the Brady Commission was reflected in its short duration. Specifically, the Brady Commission was to terminate 30 days following the issuance of its Report.

In contrast, while as an initial matter the Committee is reviewing the events of May 6, 2010, the Committee's mandate extends beyond this discrete market event; the Committee's Charter provides for a two-year duration. The establishment of the Joint CFTC-SEC Advisory Committee was one of the 20 recommendations included in the agencies' 2009 Joint Report. Subjects to be addressed by the Joint Committee include the identification of emerging regulatory risks, assessment and quantification of the impact of such risks and their implications for investors and market participants, and the agencies' efforts on regulatory harmonization.

*Transparency*

The Brady Commission operated in a less transparent environment than that currently employed by the Joint CFTC-SEC Advisory Committee. The Brady Commission held no public meetings prior to issuing its Report. While it compiled information from the SEC, CFTC, Federal Reserve, and the markets, and conducted extensive interviews with market participants and commentators, no public airing of the issues raised by these efforts was feasible prior to the release of the Commission's Report.

In contrast, the Joint CFTC-SEC Advisory Committee conducts its deliberations in an open meeting setting in accordance with the Federal Advisory Committee Act. On May 24, 2010, the Committee held an open meeting regarding the events of May 6, 2010, in order to discuss the staffs' initial findings and to identify areas that warrant further study. Another open meeting was held on June 22, 2010 in order to hear from exchanges and market participants regarding the events of May 6. This public meeting structure will be maintained when the Advisory Committee turns to other issues beyond the May 6 events.

*Objectivity*

The Brady Commission and the Joint CFTC-SEC Advisory Committee are similar in that both were structured to include independent members with a variety of perspectives on the markets. The Brady Commission consisted entirely of individuals unaffiliated with any government agency. While the Chairmen of the SEC and CFTC chair the Advisory Committee, its members are currently unaffiliated with either agency (although one member who is the Chairman of FINRA was appointed to represent the point of view of FINRA) and must act by majority vote. Thus, both the Brady Commission and the Advisory Committee were structured to help assure their objectivity, and promote findings and recommendations independent of agency influence.



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**Preliminary Findings Regarding  
the Market Events of May 6, 2010**

**Report of the Staffs of the CFTC and SEC to the Joint Advisory Committee on  
Emerging Regulatory Issues**

**May 18, 2010**

This is a report of preliminary findings by the staffs of the U.S. Commodity Futures Trading Commission and the U.S. Securities and Exchange Commission. The Commissions have expressed no view regarding the preliminary analysis or conclusions contained herein.

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## I. INTRODUCTION

The Commodity Futures Trading Commission (“CFTC”) and the Securities and Exchange Commission (“SEC” and collectively, the “Commissions”) have established a Joint CFTC-SEC Advisory Committee on Emerging Regulatory Issues (the “Committee”). The establishment of the Committee was one of 20 recommendations included in the agencies’ joint harmonization report issued last year.<sup>1</sup>

The first item on the agenda of the Committee will be to conduct a review of the market events of May 6 and to make recommendations related to market structure and liquidity issues that may have contributed to the volatility experienced on that day, as well as disparate trading conventions and rules across various markets.

This report to the Committee reflects the preliminary findings of the Commissions’ respective staffs resulting from their ongoing review of the events of May 6. The report is intended to brief the Committee regarding the May 6 events and to provide certain context regarding the current structure of the equity and futures markets and the regulatory framework for those markets.

This report includes: (a) an executive summary; (b) an overview providing general market context with respect to the events of May 6; (c) preliminary findings with respect to those events; and (d) areas for further analysis and initial next steps. In addition, this report contains several appendices providing relevant background regarding the market structure of the securities and futures markets.

It is important to emphasize that the review of the events of May 6 is in its preliminary stages and is ongoing. The reconstruction of even a few hours of trading during an extremely active trading day in markets as broad and complex as ours—involving thousands of products, millions of trades and hundreds of millions of data points—is an enormous undertaking. Although trading now occurs in microseconds, the framework and processes for creating, formatting, and collecting data across various types of market participants, products and trading venues is neither standardized nor fully automated. Once collected, this data must be carefully validated and analyzed. Such further data and analysis may substantially alter the preliminary findings presented in this report. The staffs of the Commissions therefore expect to supplement this report with further additional findings and analyses.

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<sup>1</sup> *Joint Report of the SEC and the CFTC on Harmonization of Regulation*, October 16, 2009.

## II. EXECUTIVE SUMMARY

On May 6, 2010, the financial markets experienced a brief but severe drop in prices, falling more than 5% in a matter of minutes, only to recover a short time later. Since that day, the staffs of the Securities and Exchange Commission and the Commodity Futures Trading Commission have been collecting and reviewing massive amounts of information in order to understand the events and to recommend appropriate measures.

### *SECURITIES MARKETS*

#### Preliminary Findings

May 6 started with unsettling political and economic news from overseas concerning the European debt crisis that led to growing uncertainty in the financial markets. Increased uncertainty during the day is corroborated by various market data: high volatility; a flight to quality among investors; and the increase in premiums for buying protection against default by the Greek government. This led to a significant, but not extraordinary, down day in early trading for the securities and futures markets.

Beginning shortly after 2:30 p.m.,<sup>2</sup> however, this overall decline in the financial markets suddenly accelerated. Within a matter of a few minutes, there was an additional decline of more than five percent in both the equity and futures markets. This rapid decline was followed by a similarly rapid recovery. This extreme volatility in the markets suggests the occurrence of a temporary breakdown in the supply of liquidity across the markets.

The decline and rebound of prices in major market indexes and individual securities on May 6 was unprecedented in its speed and scope. The whipsawing prices resulted in investors selling at losses during the decline and undermined confidence in the markets. Although evidence concerning the behavior of the financial markets on May 6, 2010 continues to be collected and reviewed, a preliminary picture is beginning to emerge.

At this point, we are focusing on the following working hypotheses and findings—

- (1) possible linkage between the precipitous decline in the prices of stock index products such as index ETFs and the E-mini S&P 500 futures, on the one hand, and simultaneous and subsequent waves of selling in individual securities, on the other, and the extent to which activity in one market may have led the others;
- (2) a generalized severe mismatch in liquidity, as evinced by sharply lower trading prices and possibly exacerbated by the withdrawal of liquidity by

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<sup>2</sup> All times in this report are EDT.

electronic market makers and the use of market orders, including automated stop-loss market orders designed to protect gains in recent market advances;

- (3) the extent to which the liquidity mismatch may have been exacerbated by disparate trading conventions among various exchanges, whereby trading was slowed in one venue, while continuing as normal in another;
- (4) the need to examine the use of “stub quotes”, which are designed to technically meet a requirement to provide a “two sided quote” but are at such low or high prices that they are not intended to be executed;
- (5) the use of market orders, stop loss market orders and stop loss limit orders that, when coupled with sharp declines in prices, for both equity and futures markets, might have contributed to market instability and a temporary breakdown in orderly trading; and
- (6) the impact on Exchange Traded Funds (ETFs), which suffered a disproportionate number of broken trades relative to other securities.

We have found no evidence that these events were triggered by “fat finger” errors, computer hacking, or terrorist activity, although we cannot completely rule out these possibilities.

#### Key Avenues for Further Investigation

Much work is needed to determine all of the causes of the market disruption on May 6. At this stage, however, there are a number of key themes that we are investigating.

***Futures and Cash Market Linkages.*** The first relates to the linkages between trading in equity index products, including stock index futures and the equity markets. About 250 executing firms processed transactions for thousands of accounts during the hour 2:00 p.m. – 3:00 p.m. in the E-Mini S&P 500 futures contract. Of these accounts, CFTC staff has more closely focused their examination to date on the top ten largest longs and top ten shorts. The vast majority of these traders traded on both sides of the market, meaning they both bought and sold during that period. One of these accounts was using the E-Mini S&P 500 contract to hedge and only entered orders to sell. That trader entered the market at around 2:32 and finished trading by around 2:51. The trader had a short futures position that represented on average nine percent of the volume traded during that period. The trader sold on the way down and continued to do so even as the price level recovered. This trader and others have executed hedging strategies of similar size previously.<sup>3</sup>

<sup>3</sup> Statement of Gary Gensler, Chairman, Commodity Futures Trading Commission, Before the House of Representatives Committee on Financial Services, Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises, May 11, 2010, at 8. Except as specifically



Data from the CME order book indicates that, although trading volume in E-mini S&P 500 futures was very high on May 6, there were many more sell orders than there were buy orders from 2:30 p.m. to 2:45 p.m. The data also indicate that the bid ask spread widened significantly at or about 2:45 p.m. and that certain active traders partially withdrew from the market. Considerable selling pressure at this vulnerable period in time may have contributed to declining prices in the E-Mini S&P 500 – and other equivalent products such as the SPY (an ETF that tracks the S&P 500).

All of these markets are closely linked by a complex web of traders and trading strategies. The precipitous decline in price in one market on May 6 may have influenced a sustained series of selling in other financial markets. The rapid rebound in price in one market could similarly have been linked to a rebound in price in another.

***Implications for the Equity Markets.*** The great majority of securities experienced declines that are generally consistent with the decline in value of the large indexes. Some were less than the approximately 5% decline in the E-mini S&P 500 during that period, and some were greater. Approximately 86% of securities, however, reached lows for the day that were less than 10% away from the 2:40 p.m. price.

The other 14% of securities suffered greater declines than the broader market, with some trading all the way down to one penny. The experience of these securities exposed potential weaknesses in the structure of the securities markets that must be addressed.

One hypothesis as to why the prices of some securities declined by abnormally large amounts on May 6 is that they were affected by disparate practices among securities exchanges. In the U.S. securities market structure, many different trading venues, including multiple exchanges, alternative trading systems and broker-dealers all trade the same stocks simultaneously. Disparate practices potentially could have hampered linkages among these trading venues and led to fragmented trading in some securities. Two types of disparate practices on May 6 relate to the NYSE's liquidity replenishment points ("LRPs") and the self-help remedy in Regulation NMS. These and other practices merit significant ongoing review:

- **LRPs and Similar Practices.** The NYSE's trading system incorporates LRPs that are intended to dampen volatility. When an LRP is triggered, trading on the NYSE will "go slow" and pause for a time to allow additional liquidity to enter the market. Some have suggested that LRPs actually exacerbated, rather than dampened, price volatility on May 6 by causing a net loss of liquidity, as orders were routed to other trading venues for immediate execution rather than waiting on the LRP mechanism. If this occurred, it potentially could have caused some NYSE securities to decline further than the broad market decline. However, others believe that the LRP mechanism indeed dampened

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authorized, Section 8 of the Commodity Exchange Act generally forbids disclosure of additional information regarding such traders.

volatility by rebuilding additional buy side liquidity that soaked up some of the excess selling interest in these securities on May 6. LRPs and other types of exchange procedures for handling or executing orders will be closely examined to determine whether they inappropriately impede liquidity.

- **Self-Help Remedy.** Another disparate exchange practice potentially relevant to the thinning of liquidity is the self-help remedy. Two exchanges declared self-help against NYSE Arca in the minutes prior to 2:40 p.m. Exchanges are entitled to exercise the self-help remedy when another exchange repeatedly fails to provide a response to incoming orders within one second. A declaration of self-help frees the declaring exchanges from their obligation to route orders to the affected exchange. Some have suggested the exercise of self-help led to a net loss of liquidity as the declaring exchanges stopped routing orders to NYSE Arca.
- **Stop Loss Market Orders.** An additional hypothesis as to why some securities suffered more severe declines than the broader market on May 6 is that they were particularly affected by stop loss market orders. These orders have stop prices that, for sell orders, are lower than current prices. When the stop price is reached, such orders turn into market orders to sell. In fast-falling market conditions, stop loss market orders could potentially trigger a chain reaction of automated selling if they are in place in significant quantity for a particular stock. We are investigating whether such a chain reaction led to abnormally large declines for some stocks on May 6.
- **Short Sales and Stub Quotes.** We also are examining the use of short sales and stub quotes on May 6. Our analysis thus far of broken trades has found that short sales accounted for approximately 70 % of executions against stub quotes between 2:45 p.m. and 2:50 p.m., and approximately 90 % of executions against stub quotes between 2:50 p.m. and 2:55 p.m. Notably, short sale executions against stub quotes would be subject to the alternative uptick rule (Rule 201) adopted by the SEC in February 2010, with a compliance date in November 2010.

In addition, we will evaluate the use of stub quotes by market makers. As noted above, stub quotes are not intended to be executed and effectively indicate that the market maker has pulled out of the market. Their presence at the bottom and top of order books on May 6 may have led to a very large number of broken trades. We will examine the extent to which market makers used stub quotes to nominally meet their market making obligations on May 6.

**Exchange-Traded Funds.** Of the U.S.-listed securities with declines of 60% or more away from the 2:40 p.m. transaction prices, which resulted in their trades being cancelled by the exchanges, approximately 70% were ETFs. This suggests that ETFs as a class were affected more than any other category of securities.

Based on our analysis to date, we are focused on a number of issues that may have contributed to the ETFs' experience, including:

- Because ETFs generally track securities market indices, the extraordinary price declines in certain individual securities likely contributed to the ETF price declines. For the most part, the severe ETF price declines followed, in time, the sharp decline in the broad markets. ETFs that track bond indices generally did not experience severe price declines. We therefore are considering the linkages between ETF price declines and the declines in the equity market.
- The role of market makers and authorized participants in ETFs, and whether an inability to hedge their ETF positions during periods of severe volatility may have contributed to a lack of liquidity in ETF shares.
- The use of ETFs by institutional investors as a way to quickly acquire (or eliminate) broad market exposures and whether this investment strategy led to substantial selling pressure on ETFs as the market began to decline significantly.
- The impact of ETF stop loss market orders, particularly from retail investors, on the overall ETF market price declines.
- Given that NYSE Arca is the primary listing exchange for almost all ETFs, whether the declaration of "self-help" against NYSE Arca by other exchanges may have impacted NYSE Arca-listed stocks generally and ETFs in particular. The loss of access to NYSE Arca's liquidity pool may have had a greater impact on market liquidity and trading for ETFs.

## ***FUTURES MARKETS***

### **Preliminary Findings**

Economic evidence from the futures markets is also consistent with the conclusion that a liquidity drain likely played a role in the dramatic and sudden movements in the price of stock index futures.

As noted above, preliminary data indicates that, although trading volume in E-mini S&P 500 futures was very high on May 6, there were many more sell orders than there were buy orders from 2:30 p.m. to 2:45 p.m. The data also indicate that the bid ask spread widened significantly at or about 2:45 p.m. and that certain active traders partially withdrew from the market.

Starting at 2:45:28 p.m., CME's Globex stop logic functionality initiated a brief pause in trading in the E-mini S&P 500 futures. This functionality is initiated when the

last transaction price would have triggered a series of stop loss orders that, if executed, would have resulted in a cascade in prices outside a predetermined 'no bust' range (6 points in either direction in the case of the E-mini). The purpose of this functionality is to prevent sudden, cascading declines (or increases) in price caused by order book imbalances.

The stop logic functionality has been activated previously for a variety of instruments. In the case of the E-mini S&P 500 futures, the stop logic functionality has been triggered a number of times in the past few years, including several times during the financial crisis in the Fall of 2008, when market data indicates similar conditions as those seen on May 6.

On May 6, activation of the stop logic functionality initiated a five second pause in trading on the E-mini S&P 500 futures contract. The price of the E-mini S&P 500 futures rebounded after the five second pause imposed by the stop logic functionality.

Staff analysis of market performance measures is consistent with the conclusion that a very temporary, but serious liquidity shortage occurred across the securities and futures markets.

#### ***NEXT STEPS***

##### Securities Markets

SEC staff will continue our ongoing investigation of the nature of the overall market liquidity dislocation and the impact on individual stocks. Where appropriate we are moving quickly to prevent a recurrence of the harm that investors suffered on May 6.

- We anticipate that the self-regulatory organizations (exchanges and FINRA) will propose circuit breakers for individual stocks that are designed to address temporary liquidity dislocation. Specifically, a pause in trading should provide an opportunity for all available sources of liquidity (both manual and automated) to be mobilized to meet sudden surges in demand for liquidity.
- The procedures for breaking trades that occur at off-market prices should be improved to provide investors greater consistency, transparency and predictability.
- We are also continuing to review a range of other policy options, including addressing the use of stub quotes, reviewing the obligations of professional liquidity providers and evaluating the use of various order types (market orders, stop loss orders).

### Futures Markets

CFTC staff will continue its analysis into the events of May 6. Specifically, CFTC staff is carefully reviewing the activity of the largest traders in stock index futures.

CFTC staff will also continue its analysis, already begun by our Office of Chief Economist, of liquidity provision in futures markets, with a particular focus on electronic trading. The subjects to be reviewed here include high frequency and algorithmic trading, automatic execution innovations on trading platforms, market access issues, and co-location.

CFTC staff is considering a proposed rulemaking with respect to exchange co-location and proximity hosting services. The purpose of the proposed rule would be to ensure that all otherwise qualified and eligible market participants that seek co-location or proximity hosting services offered by futures exchanges have equal access to such services without barriers that exclude access, or that bar otherwise qualified third-party vendors from providing co-location and/or proximity hosting services. Another purpose of the proposal would be to ensure that futures exchanges that offer co-location or proximity hosting services disclose publically the latencies for each available connectivity option, so that participants can make informed decisions.

CFTC staff will also be considering possible rules to enhance the CFTC's surveillance capabilities. These measures include automation of the statement of reporting traders in the large trader reporting system and obtaining account ownership and control information in the exchange trade registers.<sup>4</sup> These initiatives would increase the timeliness and efficiency of account identification, an essential step in data analysis.

### Joint Actions

- Staff also intends to pursue a joint study to examine the linkages between correlated assets in the equities (single stocks, mutual funds and ETFs), options and futures markets. The study could partly focus on examining cross-market linkages by analyzing trading in stock index products such as equity index futures, ETFs, equity index options, and equity index OTC derivatives using, to the extent practicable, market data, special call information, and order book data.
- Existing cross-market circuit breaker provisions should be re-examined to ensure they continue to be effective in today's fast paced electronic trading environment. Although the coordinated circuit breakers between futures and equities were not triggered, the events of May 6 reinforce the importance of having communication links between futures and equity markets so that there is meaningful and appropriate coordination of trading pauses and halts.

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<sup>4</sup> 17 CFR 18.04.

**PROCESS OF ANALYSIS**

Over the last ten days, the SEC and the CFTC have collected and analyzed a wide range of data from many different sources in order to prepare this preliminary report. Specifically:

- The SEC has sourced and analyzed price, time, and volume data on over 19 billion shares executed on May 6, and quote data representing the best bid and best offer for over 7,800 securities, for each exchange, for each millisecond during the trading day. Our goal is to gather data necessary to create a complete order book showing snap-shots of the full displayable depth on a particular market and audit trail data containing detailed information on all orders submitted.
  - Analysis of the complete order book is necessary to examine how changes in the provision of liquidity below the best bid, and above the best offer, led to rapid changes in execution prices, with some trades hitting high and low “stub quotes.”
  - Analysis of order audit trail data is necessary to examine what types of orders were driving these price swings (e.g., market, limit, etc).
  - The audit trail contains information on introducing brokers but does not include details regarding the trading activity of specific market participants. Currently, such data is only available directly from broker-dealers through “blue sheet” requests. Furthermore, even in this data participants are identified only in the way that they are known to the broker-dealer, as there are currently no uniform standards<sup>5</sup>
  - The order book and order audit trail are maintained at exchanges, FINRA, broker-dealers and other market centers. In some cases this information must be collected by the SROs, and then must be compiled and organized by the SEC. Every exchange has established its own requirements for what constitutes an audit trail, including what items are captured, how they are named, and the structure of the data file.
- The SEC has sourced and analyzed aggregate data on the volume and type of liquidity, provided and taken, by the largest liquidity providers and takers on various exchanges.
- The SEC has worked extensively with the relevant securities exchanges and FINRA to assess the circumstances of the market events on May 6. In addition, the SEC is analyzing detailed data for all *NYSE LRP*s occurring on May 6<sup>th</sup>, as well as over the last 5 months.
- CFTC staff has analyzed transaction and order book data on stock index futures, including the E-Mini S&P 500 futures contract.

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<sup>5</sup> For example, the same market participant may be known to different broker-dealers by different names making the aggregation of orders for a single participant very difficult. For further details, see the SEC’s recent proposal for the Large Trader Reporting System.

- CFTC staff has been reviewing information from a special call on over 40 large traders for their trading activity in the E-mini S&P 500 and Russell 2000 futures contracts on May 6, 2010. A special call is a CFTC directive to a trader holding a reportable position to furnish any pertinent information concerning the trader's positions, transactions, or activities.
- CFTC staff also has been reviewing information from a special call to swap dealers about their activity in over-the-counter broad-based security index derivatives markets on May 6, 2010. In addition, staff has been engaged in a detailed review of trader activity on May 6 through a comprehensive examination of trade-register data. To date, staff has received over 25 gigabytes of data in over 307,000 files, with more data expected.

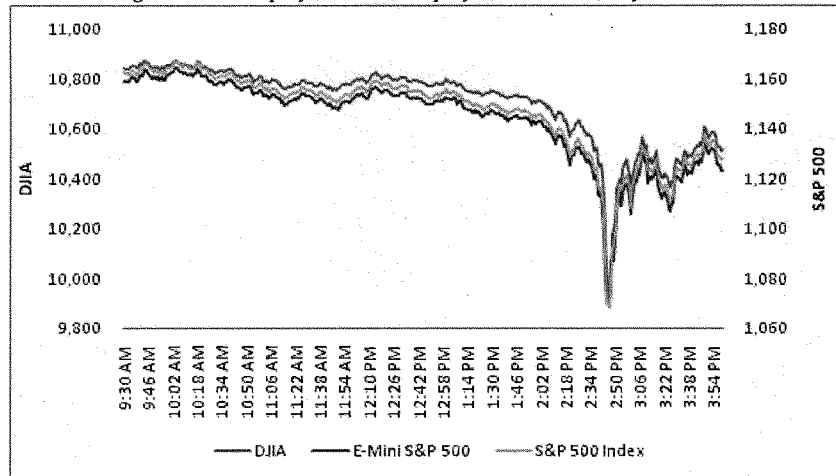
Both the CFTC and the SEC have had extensive conversations with a wide variety of market participants (investors, hedge funds, exchange traded funds, dealers, high frequency traders, etc.) to better understand their trading activities throughout May 6, and to gather *anecdotal evidence* from which common themes and/or trends can be identified to inform further areas of investigation.

### III. GENERAL MARKET CONTEXT

This section provides general market context for the trading activity on May 6.

Throughout the day on Thursday, May 6, many financial news outlets were reporting on political and economic events that were creating uncertainty in the financial markets. This increased uncertainty during that day is evidenced by patterns observable in financial market data. There is evidence of increasing volatility throughout the day, a “flight to quality”<sup>6</sup> (as seen in the rise in the price of gold and decline in U.S. Treasury yields), an increase in the price of premiums on credit default swaps to protect against the risk of default on European sovereign debt, and downward pressure on the Euro in global currency markets. All major broad-based equity indices and equity index futures spent much of the morning and early afternoon in negative territory (see chart below). For example, between 9:30 a.m. and 2:00 p.m., the Dow Jones Industrial Average (DJIA) declined 161 points to 10,712 (-1.5%), the S&P 500 Index declined 33 points to 1,145 (-2.9%), and the E-mini S&P 500 Index futures declined 15 points to 1,143 (-1.3%).

Figure 1: Select Equity Indices and Equity Index Futures, May 6, 2010



Source: Bloomberg

<sup>6</sup> Flight to Quality is a term used to describe the movement of capital into asset classes that are perceived to be less risky during times of financial uncertainty.



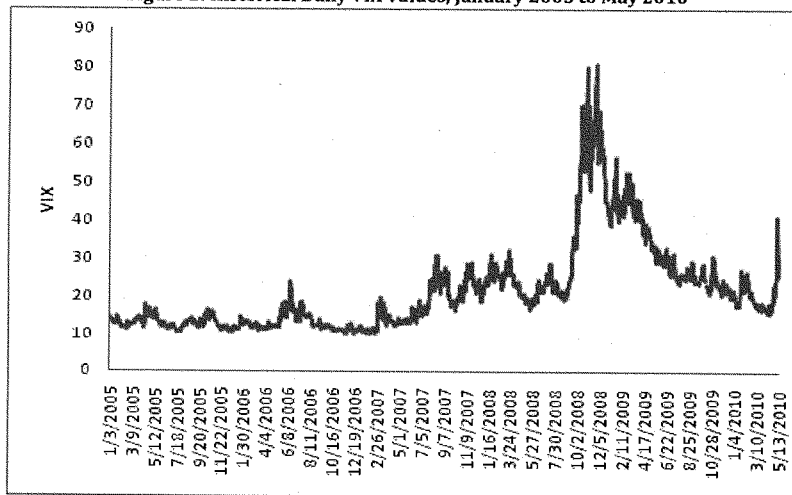
## Indicators of Market Uncertainty

### Market Volatility

A general indicator of market uncertainty is the Chicago Board Options Exchange SPX Volatility Index (“VIX”). The VIX is a measure of the expected volatility of the S&P 500 index, based on options prices, and is sometimes colloquially referred to as the “fear index.” The VIX provides a picture of the expected range of S&P 500 index returns in the next 30 days. Higher values of the VIX imply a greater range of returns, both positive and negative. Thus, increases in the VIX signal increased uncertainty about possible stock returns.

As seen in Figure 2, in 2010 the VIX prior to May 6 has averaged 19.58, a level that indicates much lower expected market volatility when compared to the VIX averages of 2008 (32.69) and 2009 (31.48). The elevated VIX levels from 2008 and 2009 were associated with a broader financial market crisis. Since then, the average level of the VIX has returned to levels that are consistent with the pre-2008 period. For example, in April the VIX averaged 17.42. For the month of May through May 14 the VIX has averaged 28.33.

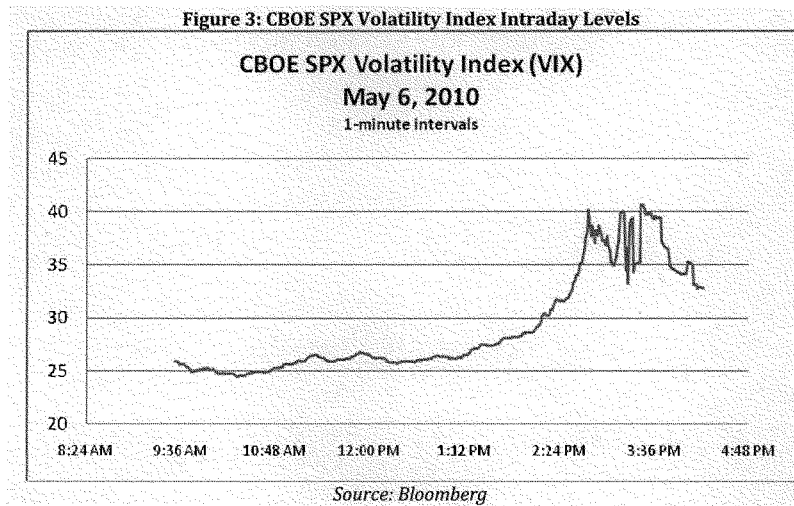
Figure 2: Historical Daily VIX Values, January 2005 to May 2010



Source: Bloomberg

On May 6, the VIX opened at 25.88. This represents a 15.5% increase from when the trading week began on Monday, May 3 at 22.41. After staying level for most of the day, the VIX began to rise around 1:30 p.m. At 2:00 p.m. the VIX had increased 2.72 points or 10.5% from its opening level, signaling increasing expected volatility in the

S&P 500 Index. Over the next half-hour, the VIX steadily increased an additional 3.11 points to 31.71, up 22.5% from the open. A nearly continuous rise in the VIX signals higher levels of expected market risk and uncertainty going forward. The increase in the VIX then accelerated and the index reached 40.26 by 2:46 p.m. Had markets closed at the 2:46 p.m. level of 40.26, it would have represented a 61.6% increase from the previous day's close and would represent the fourth largest single-day increase in market volatility. Ultimately, the VIX closed at 32.80, a 31.7% increase from the previous day's close.<sup>7</sup>

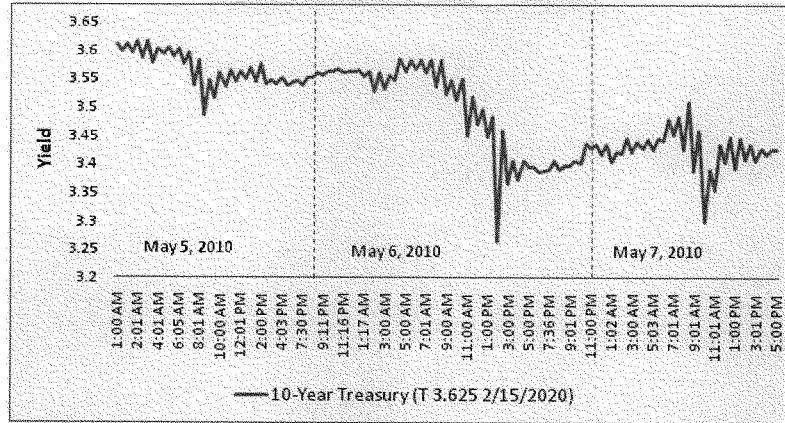


#### *Flight to Quality*

Gold and U.S. Treasuries are assets that have historically been in high demand during periods of market uncertainty. On May 6, the COMEX nearby gold futures contract rose steadily from approximately \$1,180 to \$1,210 per troy ounce from the market open to its close at 1:30 p.m. Additionally, the ten-year Treasury yield fell from 3.58% on May 5 to an intraday low of 3.26% before settling at 3.41% (see Figure 4).

<sup>7</sup> The three highest single-day increases in the VIX are 10/19/87 (312.95%), 10/13/89 (68.30%), and 2/27/07 (64.22%).

Figure 4: Ten-Year U.S. Treasury Note Yield



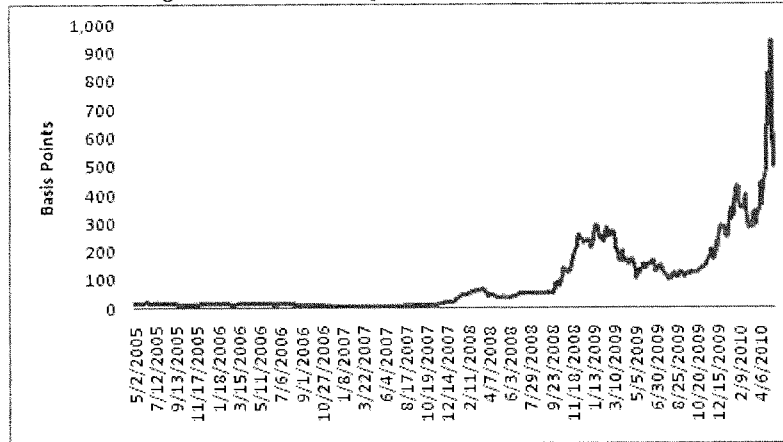
Source: Bloomberg

### Credit Default Swaps

The credit derivatives markets indicated increased uncertainty over the ability of the government of Greece to service its debt. Spreads on CDS protecting against the default of debt securities issued by Greece widened on May 6 to 937.9 basis points, up from 844.2 basis points the previous day.<sup>8</sup> This essentially meant that the price of premiums to protect against a default by Greece had increased. This widening coincided with the European Central Bank's press conference, beginning at 8:30a.m., in which the Bank did not address the possibility of purchasing Greek government bonds. Figure 5 shows CDS spreads on Greek sovereign debt over the past five years.

<sup>8</sup> A CDS spread widening means that it will cost more for a company to insure against default, because the market sees default as more likely than it previously did. In other words, someone who wants to buy protection on a risk of default of a debt has to pay a higher premium.

Figure 5: Credit Default Spreads on Greek Sovereign Debt

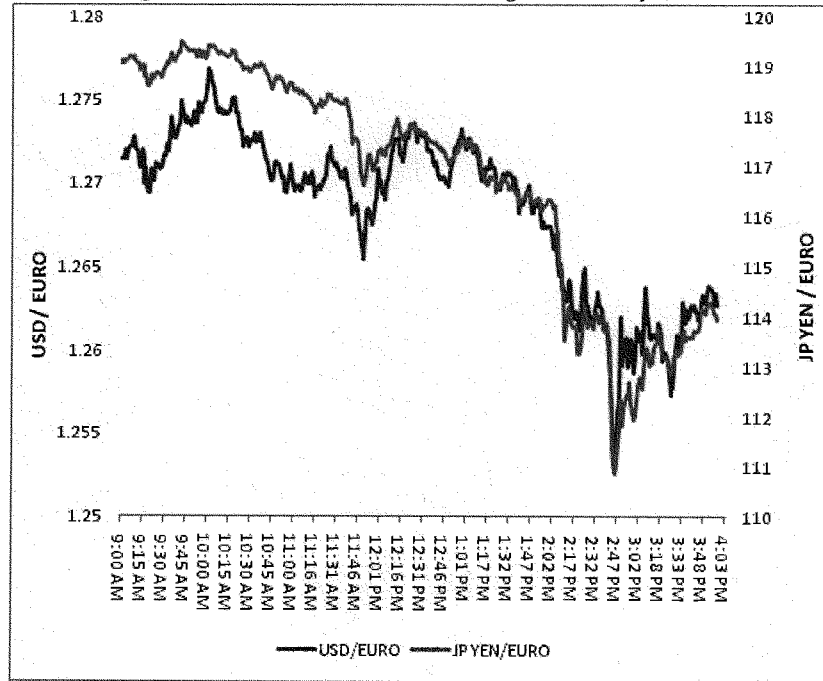


Source: Bloomberg

*Euro Declines Against the Dollar and Yen*

In addition, global currency markets were indicating concern over the financial stability of the European Union. Shortly after 1:00 p.m., the Euro began a sharp decline against both the U.S. Dollar and the Japanese Yen (see Figure 6).

Figure 6: Euro-Dollar and Euro Yen Exchange Rates on May 6, 2010



Source: Bloomberg

*Events During the Afternoon of May 6*

By approximately 2:45 p.m. over 200 securities had fallen 50% or more from their 2:00 p.m. levels. Between 2:45 p.m. and 2:47p.m., the DJIA, S&P 500, and NASDAQ100 all reached daily lows. During this same period, all 30 DJIA components reached their intraday minima, representing a range from -4% to -36% from their opening levels. The DJIA bottomed at 9,872.57, the S&P 500 at 1,065.79, and the NASDAQ100 at 1,752.31. The E-mini S&P 500 index futures contract bottomed at 1,056.

After bottoming, equity and equity index futures markets began to rebound. At 2:50 p.m. the DJIA was trading at 10,232 and the E-mini S&P 500 was trading at 1,096. The E-mini S&P 500 climbed further to 1,118 by 2:53 p.m. The DJIA closed at 10,520.32, down 347.68 points, or 3.2%, from the prior day's close. The E-mini S&P 500 settled at 1,122.5, down 41.5 points, or 3.6%, from the prior day's settlement.

#### IV. PRELIMINARY FINDINGS

##### A. Securities Markets

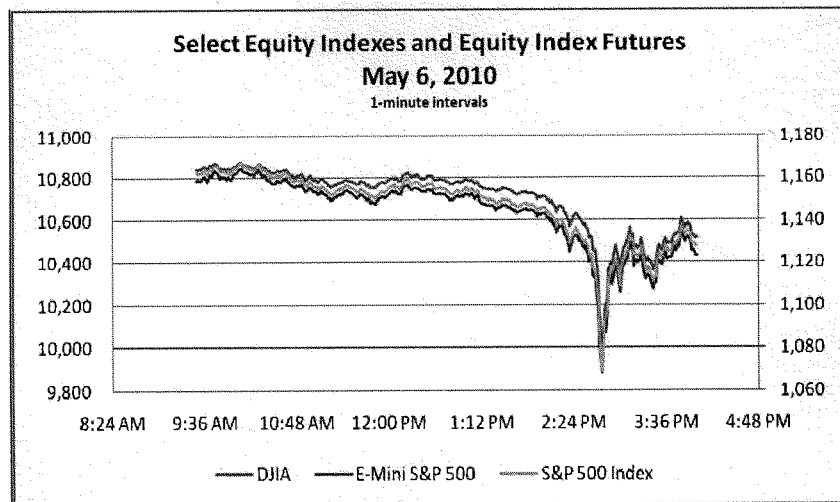
The market events of May 6, 2010 included a surge in trading in the stock markets, with total trading volume on that day of 19.4 billion shares, approximately 2.2 times the average daily trading volume in the 4<sup>th</sup> quarter of 2009. The trading volume in NYSE-listed stocks across all trading venues on May 6 represented the second highest daily volume on record, while May 6 volume in NASDAQ-listed stocks across all trading venues was the highest on record.

The severe price decline and recovery that occurred during a period of approximately 20 minutes on the afternoon of May 6 can usefully be described in terms of two broad but related themes: (1) a precipitous drop in value of more than 5% followed immediately by a rapid recovery, both of which occurred consistently across various broad market indices and products; and (2) extreme price fluctuations – mostly losses – that occurred for certain individual securities, followed relatively promptly by reversions to price levels consistent with the broader market. These two themes are discussed below.

##### 1. Broader Market Drop and Recovery

On May 6, a wide variety of broad market indices and products displayed similar behavior – a severe price decline immediately followed by a rapid recovery during a 20-minute period. This phenomenon is illustrated by the following price chart of the DJIA, the S&P 500 Index, and the E-mini S&P 500 futures (Figure 7).

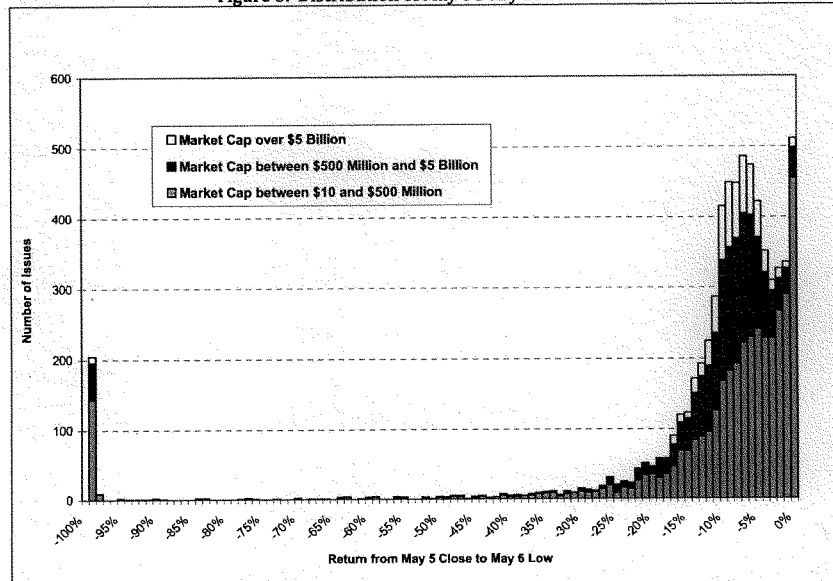
Figure 7: Equity Indices and Equity Index Futures



Until approximately 2:40 p.m., the figure reflects a significant, but not extraordinary, down day that was influenced by multiple negative economic factors, as noted in the previous section. At approximately 2:40 p.m., however, prices declined with extraordinary velocity. Each of the indices fell in excess of 5% within 5 minutes, and then immediately began a recovery that exceeded 5% within 10 minutes.

Most individual stocks declined by amounts that were generally consistent with the broader market decline. Approximately 86% of U.S.-listed securities reached lows for the day that were less than 10% away from the 2:40 p.m. price (a useful benchmark for the market price before the rapid market decline and recovery). The remaining 14% of U.S.-listed securities reached lows that exceeded 10% (these securities are discussed in greater detail in section IV.A.2 below).

**Figure 8: Distribution of May 6 Daily Lows<sup>9</sup>**



Sources: Thomson Financial Datastream and NYSE Trades and Quotes.

<sup>9</sup> This figure depicts the distribution of returns from the close on May 5 to the lowest transaction price on May 6. The securities included are equity securities (common and preferred) of corporate issuers, exchange-traded products, closed-end funds, and ADRs, traded on major U.S. exchanges, and having in each case, as of the May 5 close, a share price of more than \$3.00 and a market capitalization of at least \$10 million.

Figure 8 illustrates in more detail the behavior of these two groups of individual securities. It shows that, for the day, there is a concentration of daily lows at a point near 7% below the May 5 close, on the right-hand side of the graph. The distribution of lows for individual securities around this point is consistent with a day where the ETF that tracks the S&P 500 Index transacted 8.5% below the previous day's close. The figure notably also shows that some securities exhibited substantially more pronounced daily lows than the decline in the broad market would imply. In particular, approximately 200 securities traded, at their lows, almost 100% below their previous day's values, as represented by the spike at the left-hand side of the graph. The incidence of extreme daily lows for large capitalization stocks (depicted on the graph in yellow) appears to be lower than for smaller capitalization stocks (depicted in the graph in purple).

An examination of individual trades during the 2:40 p.m. - 3:00 p.m. period reveals a similar pattern. Table 1 and Table 2 below report the total number of trades, the total share volume and total dollar volume for trades executed between 2:40 p.m. and 3:00 p.m., for losses and gains, respectively. The losses/gains are computed as the difference between the trade price and the 2:40 p.m. price, divided by the 2:40 p.m. price, for each stock. The data do not include out-of-sequence trades.<sup>10</sup> Table 1 indicates that most investors that sold during this period transacted at prices that were within -10% away from the 2:40 p.m. price. Approximately 4.9 million, or 98%, of the trades that were executed during this period at prices less than the 2:40 p.m. price were within -10% of the 2:40 p.m. price. Approximately 102,000 trades were executed during the decline and recovery at prices that were -10% or more away from the 2:40 p.m. price; these trades are discussed in section IV.A.2 below. We see a similar pattern in Dow stocks. Four out of 30 (about 13%) had returns that were less (more negative) than -10%. Table 3 indicates the lowest trade price executed for each of the Dow Jones Industrial Average component stocks and the return computed against the stock's 2:40 p.m. trade price. Of these stocks, four, Proctor & Gamble (PG), 3M (MMM), Hewlett-Packard (HPQ), and General Electric (GE), traded at a loss of over 10%, relative to the 2:40 p.m. price.

<sup>10</sup> An "out-of-sequence" trade occurs when the TAQ data identifies the posted trade time as incorrect. In this case, the actual time at which the trade was placed is unknown.



**Table 1: Trades Executed at a Loss**

	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	7,135,104	1,995,000,637	56,651,582,692
Losses	5,013,724	1,358,709,226	38,047,617,508
0% to -10%	4,912,125	1,324,448,213	37,383,122,363
-10% to -20%	63,890	22,171,745	522,444,343
-20% to -30%	12,923	4,077,881	85,328,519
-30% to -40%	6,112	2,317,245	30,461,333
-40% to -50%	2,519	767,393	9,641,261
-50% to -60%	1,682	472,624	8,334,944
-60% to -70%	1,056	370,920	4,328,898
-70% to -80%	798	292,061	2,245,851
-80% to -90%	1,109	237,259	1,152,480
-90% to -100%	11,510	3,553,885	557,516

**Table 2: Trades Executed at a Gain**

	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	7,135,104	1,995,000,637	56,651,582,692
Gains	2,121,380	636,291,411	18,603,965,183
0% to 10%	2,108,076	632,378,310	18,079,956,948
10% to 20%	10,075	3,039,456	53,123,704
20% to 30%	927	281,383	8,589,789
30% to 40%	517	167,439	1,827,449
40% to 50%	106	32,866	536,641
50% to 60%	45	19,188	358,048
60% to 70%	67	14,466	387,321
70% to 80%	184	46,456	1,147,215
80% to 90%	178	44,075	1,143,755
> 90%	1,205	267,772	456,894,313

**Table 3: Maximum Trade Loss for Dow 30 Stocks**

<b>Company</b>	<b>Return</b>	<b>Low Price</b>	<b>Time</b>
The Proctor& Gamble Company	-36.14%	\$39.37	2:47:15 PM
3M Company	-18.39%	\$67.98	2:46:06 PM
Hewlett-Packard Company	-11.81%	\$41.94	2:46:13 PM
General Electric Company	-10.23%	\$15.00	2:46:11 PM
Merck & Company Incorporated	-9.23%	\$30.70	2:46:11 PM
Exxon Mobil Corporation	-8.74%	\$58.46	2:46:52 PM
E.I. Du Pont De Nemours	-8.13%	\$33.66	2:46:29 PM
Cisco Systems Incorporated	-7.52%	\$23.23	2:45:33 PM
The Walt Disney Company	-7.49%	\$31.00	2:45:45 PM
United Technologies Corporation	-7.42%	\$65.17	2:46:38 PM
International Business Machines Corporation	-7.20%	\$116.00	2:46:33 PM
Chevron Corporation	-7.18%	\$71.50	2:47:03 PM
Intel Corporation	-6.09%	\$19.90	2:47:30 PM
The Boeing Company	-5.89%	\$62.00	2:45:42 PM
Verizon Communications	-5.73%	\$26.49	2:45:48 PM
Johnson & Johnson	-5.70%	\$60.03	2:46:10 PM
Kraft Foods Incorporated	-5.21%	\$27.49	2:47:59 PM
Home Depot Incorporated	-5.06%	\$32.07	2:45:57 PM
Pfizer Incorporated	-4.64%	\$15.85	2:46:06 PM
Caterpillar Incorporated	-4.50%	\$58.00	2:45:33 PM
American Express Company	-4.47%	\$40.16	2:45:52 PM
Alcoa Incorporated	-4.34%	\$11.25	2:47:35 PM
Microsoft Corporation	-4.16%	\$27.91	2:46:39 PM
AT&T Incorporated	-3.88%	\$24.04	2:46:04 PM
Wal-Mart Stores Incorporated	-3.74%	\$51.53	2:45:29 PM
Bank of America Corporation	-3.55%	\$15.50	2:46:36 PM
The Coca Cola Company	-3.47%	\$51.21	2:47:23 PM
McDonalds Corporation	-3.43%	\$67.49	2:47:53 PM
JP Morgan Chase & Company	-2.51%	\$39.29	2:45:45 PM
The Travelers Companies Incorporated	-2.31%	\$48.53	2:45:46 PM

Both aspects of the 20-minute phenomenon—the effects on the broad market and the even more extreme effects on a minority of securities—warrant serious analysis, given the potential harm to investor confidence and the realized losses of investors. Although the state of our fact-gathering makes any analysis at this time too preliminary to draw firm conclusions—or even many tentative ones—about how and why the events of May 6 occurred, the facts we have and the analysis we have completed thus far do offer a few clues to the origins of the May 6 event.

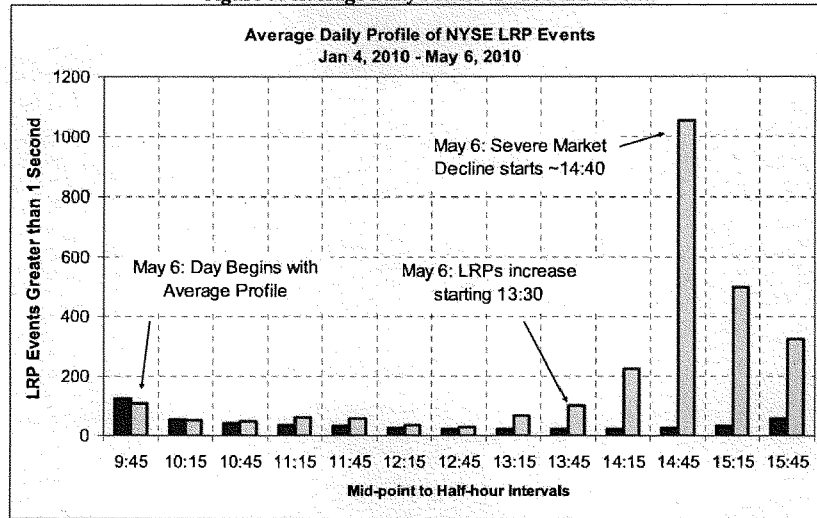
We are in the process of obtaining and reviewing the order book and the data necessary to reconstruct the order audit trail for the various equity exchanges and electronic communications networks (“ECNs”) in the hope of being able to determine whether order book liquidity substantially thinned immediately prior to 2:40 p.m. For example, based on some preliminary data, there may be reason to believe that there may have been a thinning of order book liquidity at one significant exchange at around 2:00 p.m.

The temporary nature of the decline in prices in the broader market may be indicative of a failure in liquidity. As we will show, many individual securities exhibited more extreme temporary price movements than the broad market, consistent with a broader set of liquidity failures. The discussion that follows focuses on a key issue on May 6 – the interaction between liquidity demand and supply. A temporary price dislocation could be caused by an unusually high demand for liquidity, by an unusually weak supply of liquidity, or by some combination of these factors. Our preliminary analysis indicates that both of these factors may be at play. In this section, we focus on questions that bear on this central issue.

NYSE’s trading system incorporates LRPs that are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of a sufficient size is reached. In such case, trading on the NYSE will “go slow” and pause for a time period to allow an opportunity for additional liquidity to enter the market. During an LRP, the NYSE will display a quotation that is not immediately accessible and can be bypassed, but is not required to be bypassed, by other trading venues and order routers.

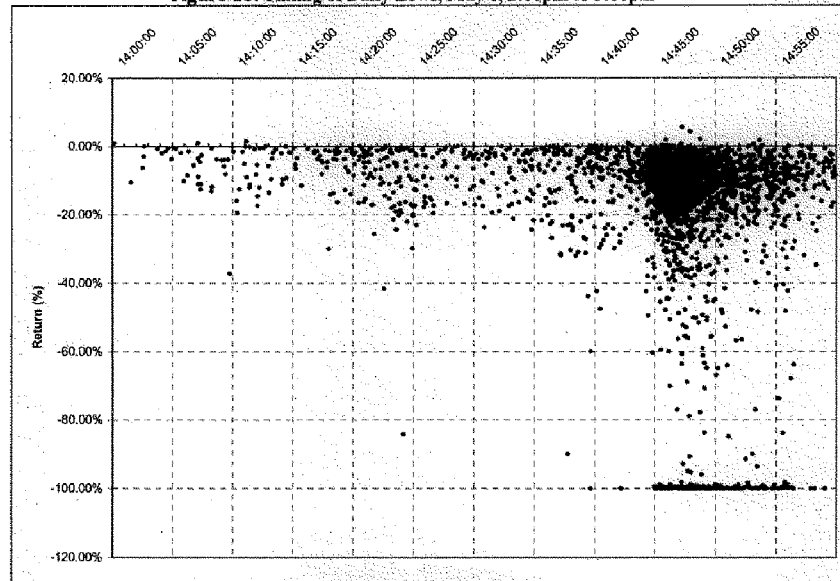
Figure 9 compares the May 6 LRP profile on the NYSE with the average profile of such events during 2010. The figure indicates the number of securities that triggered an LRP event lasting more than 1 second during any given 30-minute period. The blue blocks, reported first in the series, represent the average number of securities meeting this criterion from January 4, 2010 through May 6, 2010. The yellow blocks, reported second in the series, represent the LRP events on May 6, 2010 itself.

Figure 9 shows a substantial increase in the number of securities with LRPs on the NYSE starting in the period from 1:00 p.m. to 1:30 p.m. and rising to more than 200 in the period from 2:00 p.m. to 2:30 p.m. Between 2:30 and 3:00 pm, the level rose to approximately 1,000. This significant rise in LRPs could be indicative of a thinning of order book liquidity at the NYSE.

**Figure 9: Average Daily Profile of NYSE LRP Events**

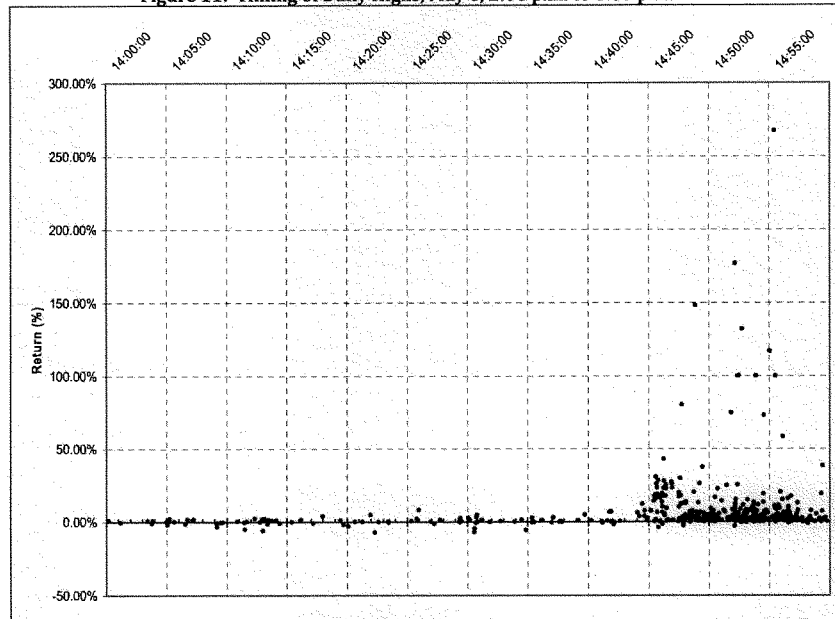
Finally, Figure 10 shows a scatter plot of the time and percentage decline for all securities that realized their daily low measured from May 5 close to their May 6 low during the period between 2:00 p.m. and 3:00 p.m. Each point on the plot represents one stock, the time of day it executed a trade at its lowest trade price of the day, and the return from the previous night's close to that trade price. It shows a steady increase in the number of securities with daily lows throughout the hour.

**Figure 10: Timing of Daily Lows, May 6, 2:00pm to 3:00pm<sup>11</sup>**



Source: Thomson Financial Datastream and NYSE Trades and Quote

<sup>11</sup> Figure 10 depicts the timing of daily lows during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the lowest transaction price on May 6, plotted against the time at which the transaction occurred. Daily lows not occurring during this one-hour interval are not depicted. The figure includes all equity securities (common and preferred) of corporate issuers, exchange-traded products, closed-end funds, and ADRs, traded on major U.S. exchanges, with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close.

**Figure 11: Timing of Daily Highs, May 6, 2:00 p.m. to 3:00 p.m.<sup>12</sup>**

Sources: Thomson Financial Datastream and NYSE Trades and Quote.

While a large number of securities experienced extreme low trades during the 2:00 p.m. to 3:00 p.m. interval, a smaller but still significant number of securities experienced extreme highs. Figure 11 indicates positive returns on May 6, excluding a few stocks for scaling reasons. The figure shows that a significant number of securities experienced daily highs more than 25% higher than their close on May 5. These extreme highs were concentrated after 2:44 p.m. Unlike the lows depicted in Figure 10, which began to occur in the early part of the hour, there appear to be no extreme highs occurring prior to 2:44 p.m.

Another factor potentially relevant to the thinning of liquidity is the declaration of self-help by NASDAQ against NYSE Arca at 2:37 p.m., and by NASDAQ OMX BX against NYSE Arca at 2:38 p.m. We have not yet evaluated the basis for the exercise of

<sup>12</sup> Figure 11 depicts the timing of daily highs during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the highest transaction price on May 6, plotted against the time at which the transaction occurred. Daily highs not occurring during this one-hour interval are not depicted. The figure includes all equity securities (common and preferred) of corporate issuers, exchange-traded products, closed-end funds, and ADRs, traded on major U.S. exchanges, with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close. For scaling purposes, Figure 11 excludes returns to daily highs on a few equity securities of corporate issuers.

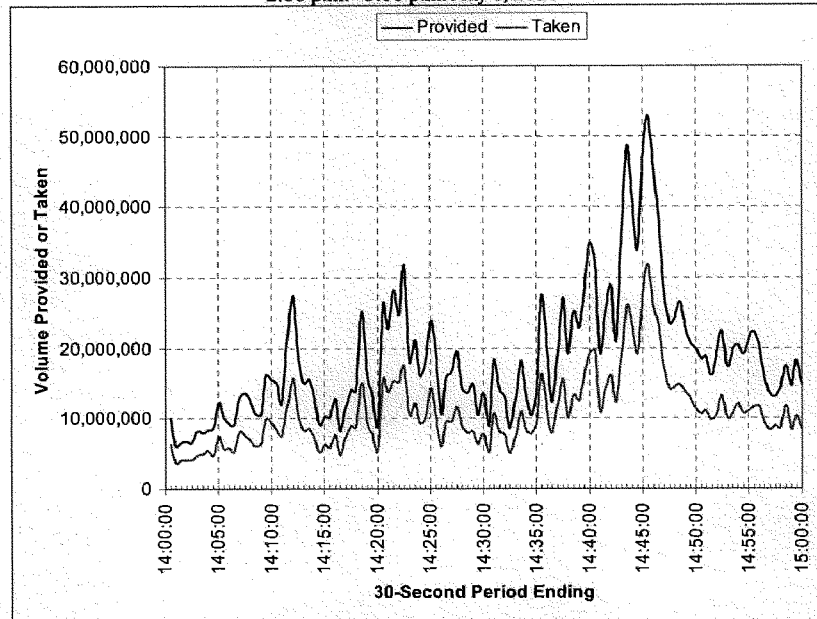
self-help against NYSE Arca. Under Regulation NMS, exchanges are entitled to exercise self-help when another exchange repeatedly fails to provide a response to incoming orders within one second. The direct effect of a declaration of self-help is that the declaring exchanges will no longer route orders to the affected exchange. We are not aware, however, that any broker-dealer or any other exchange declared self-help against NYSE Arca prior to the time the broad market indexes reached their daily lows.<sup>13</sup> Consequently, the broker-dealers and other exchanges that wished to access NYSE Arca quotes would have been likely to route orders directly to NYSE Arca (and therefore would not have been affected by a self-help declaration), rather than trying to access those quotes indirectly through NASDAQ or NASDAQ OMX BX. Accordingly, we are evaluating the extent to which the declaration of self-help by the two exchanges against NYSE Arca prior to 2:40 p.m. could have caused a significant thinning of available liquidity.

Another interesting question remains as to whether electronic liquidity providers pulled back during the relevant timeframe. At approximately 2:40 p.m. on May 6, prices declined rapidly across many trading venues and products. The activities of electronic liquidity providers are important subjects for analysis. These proprietary trading firms have come to be the dominant type of liquidity provider in the U.S. equity markets. Consequently, we are analyzing their activities on May 6. As noted above, we are in the process of obtaining and reviewing the order book data of exchanges and ECNs. We have, in the meantime, obtained other data from the exchanges concerning the activity of their top ten liquidity providing firms from 2:00 p.m. to 3:00 p.m. We continue to analyze these data to assess the activity of these liquidity providing firms. Some initial findings based on these data are set forth in Figure 12 and Figure 13 below.<sup>14</sup>

<sup>13</sup> Two other exchanges – BATS and NSX – exercised self-help against NYSE Arca after this time.

<sup>14</sup> All of the equity exchanges provided data on their liquidity providers. Each exchange was requested to identify and provide data on the top ten overall liquidity providers (“Top Ten Providers”) on the exchange on May 6. For each of the Top Ten Providers, the exchange was requested to provide (1) the number of trades and share volume of liquidity provided on the exchange from 2:00 p.m. to 3:00 p.m., broken down in 30 second intervals, for all securities traded on the exchange in the aggregate; and (2) the number of trades and share volume of liquidity removed on the exchange from 2:00 p.m. to 3:00 p.m., broken down in 30 second intervals, for all securities traded on the exchange in the aggregate.

**Figure 12: Liquidity Provided/Taken by Top 10 Liquidity Providers Across All Equity Markets  
2:00 p.m. - 3:00 p.m. May 6, 2010<sup>15</sup>**

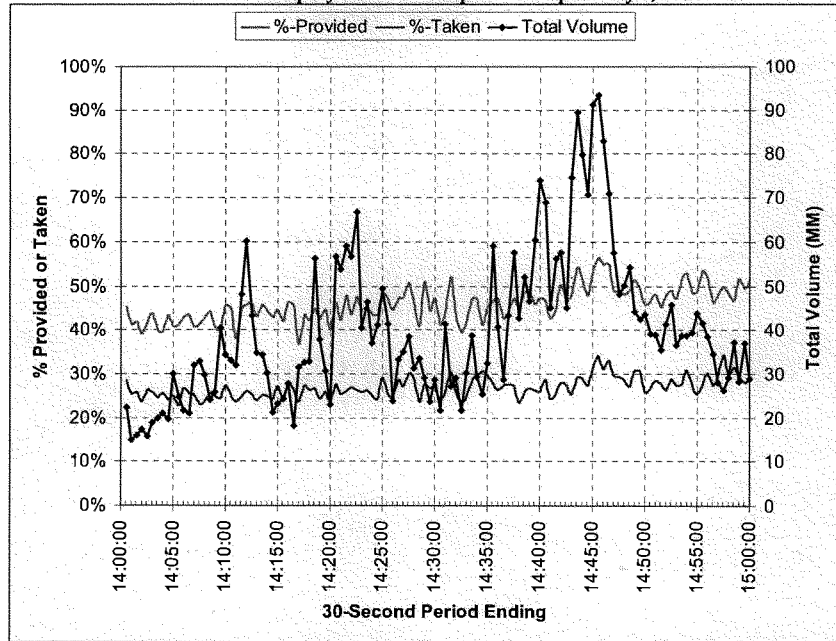


Source: All data was provided by the exchanges

<sup>15</sup> The aggregate number of shares taken and provided by each of the top ten liquidity providers for each exchange reported in 30-second intervals.



**Figure 13: Percent of Liquidity Provided/Taken by Top 10 Liquidity Providers against Total Volume Across all Equity Markets 2:00 p.m. – 3:00 p.m. May 6, 2010<sup>16</sup>**



Sources: Liquidity data provided by the exchanges; total volume from NYSE Trades and Quotes.

Figure 12 shows the share volume of aggregate liquidity provided and removed for all stocks by the top 10 firms for all of the exchanges between 2:00 p.m. and 2:59 p.m. Figure 13 shows the percentage of liquidity provided and removed against the total volume across all equity markets. Figure 12 and Figure 13 could indicate that, collectively, these particular firms appear to have remained net liquidity providers throughout this period and that they increased their liquidity provision, both in terms of share volume and percentage of total volume, when total volume increased at approximately 2:40 p.m. We note, however, that the underlying data provided by the exchanges as the source for these figures are also consistent with significant variations in the activities of different liquidity providers during this period. In addition, it should be noted that Figure 12 and Figure 13 represent only the number and percentage of shares of liquidity, and not the prices of the transactions which, of course, are important to a complete understanding of liquidity provider behavior. Anecdotal evidence, moreover, indicates that at least some large electronic liquidity providers and other liquidity providers did withdraw from the market during this time. We continue to analyze the conduct of these and other primary liquidity providing firms.

<sup>16</sup> The percent provided and taken and provided by each of the top ten liquidity providers for each exchange reported in 30-second intervals.

## 2. Securities that Suffered Declines Disproportionate to the Broader Market

As noted above, the great majority of individual securities traded at prices that were consistent with the broader market decline during the day, while approximately 14% of U.S.-listed securities reached lows for the day that were more than 10% away from the 2:40 p.m. price. Table 1 and Figure 8 above show that a similar proportion of trades in securities hit lows for the day that were more than 10% from the previous day's close.<sup>17</sup> This section discusses the individual securities that suffered declines that are out of proportion to the broader market. We first focus on broken trades, including ETFs in particular. The actual dollar volume of these broken trades was of course small, due to artificially low share prices involved, but the shares involved in those trades would have been valued at \$212.4 million, at their 2:40 p.m. benchmark price. (See Table 7 below). We then address securities that otherwise experienced unusually severe declines without reaching the threshold for broken trades.

### a) Securities with Broken Trades

The securities exchanges and FINRA have adopted “clearly erroneous execution rules” that are designed to permit them to cancel trades that in their determination were clearly entered into in error.<sup>18</sup> On May 6, under these rules, the SROs broke trades that were effected from 2:40 p.m. to 3:00 p.m. at prices 60%<sup>19</sup> away from the last trade at or before 2:40 p.m. Table 4 below provides certain information regarding the securities in which trades were broken.<sup>20</sup>

A total of 7,878 securities were traded during this period. Trades were broken in 326 individual securities, consisting of those that experienced a very severe price move of 60% or greater from the 2:40 p.m.<sup>21</sup> No trades were broken in any of the stocks that comprise the DJIA. Trades were broken in only 12 stocks that are included in the S&P 500 Index and in only 30 stocks included in the smaller capitalization Russell 2000

<sup>17</sup> We use 10% as an estimated cutoff for stocks that declined by amounts consistent with the overall market decline because, on any given day with a significant decline in prices, some stocks will decline less and some will decline more. On May 6, for example, 11 DJIA stocks declined by less than 5% from the 2:40 p.m. price, and 26 DJIA stocks declined by less than 10% from the 2:40 p.m. price. (Table 3)

<sup>18</sup> See description of clearly erroneous rules in Appendix A.

<sup>19</sup> Following the wide-scale disruption of May 6, 2010, the exchanges and FINRA settled on the relatively high 60% standard for breaking trades. We understand a substantially lower standard – 10%-20% – typically is selected for the more common discrete erroneous trade events involving one or a few securities. The SEC is working with the exchanges and FINRA to establish more transparent and objective standards for breaking erroneous trades.

<sup>20</sup> The term “broken trades” for these purposes means all trades identified as broken trades by the exchanges and FINRA for May 6, 2010.

<sup>21</sup> From April 1, 2010 to May 5, 2010, the average number of broken trades (excluding FINRA trades) was 118.25.

Index. Trades were broken in 227 of the 838 ETFs, however. These ETFs represent 69.6% of all securities with broken trades.

**Table 4: Distribution of Securities and Securities with Broken Trades**

	Market		Broken	
	Total	%	Total	%
<b>Securities</b>	7,878	100.0%	326	100.0%
<b>Primary Listing on NYSE</b>	3,277	41.6%	56	17.2%
<b>Primary Listing on NASDAQ</b>	2,946	37.4%	42	12.9%
<b>Primary Listing on ARCA</b>	1,088	13.8%	225	69.0%
<b>Primary Listing on Amex</b>	567	7.2%	3	0.9%
<b>Component of DJIA</b>	30	0.4%	0	0.0%
<b>Component of S&amp;P 500</b>	500	6.3%	12	3.7%
<b>Component of Russell 2000</b>	2,000	25.4%	30	9.2%
<b>Exchange-Traded Fund</b>	838	10.6%	227	69.6

The distribution of all stocks and stocks that had broken trades on May 6, 2010 by primary listing exchange, inclusion in key stock indices and the number of Exchange Traded Funds

Sources: NYSE, NYSEAmex, NYSE Arca, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.

The 99 securities<sup>22</sup> with broken trades that are not ETFs include securities of a wide variety of issuers, both large and small (including 10 exchange-traded products, or ETPs, that are not ETFs) and there may be a variety of explanations for their aberrant behavior. We continue to investigate the trading in these securities on May 6 to determine whether there is a common cause or causes for the trading anomalies, such as a particular susceptibility to liquidity withdrawal or an unusually large number of stop loss market orders.

Tables 5 and 6 below provide certain information regarding the distribution of trades that were broken, both by trading venue and by time period. These tables show that 20,761 trades were broken on May 6, with 12,306 (59.3%) broken by NASDAQ, 4,903 (23.6%) broken by NYSE Arca, 1,816 (8.7%) broken in the OTC market, and 1,094 (5.3%) broken by BATS. No trades were broken by NYSE.

Table 5 and Table 6 show the distribution of securities in which broken trades occurred by markets.<sup>23</sup>

<sup>22</sup> The total of 326 securities with broken trades is comprised of 227 ETFs, 10 ETPs that are not ETFs and 89 stocks.

<sup>23</sup> The number of broken ADF/TRF trades counts only trades that were not rejected by ACT and that were reported to the tape.

**Table 5: Number of Trades Executing on Each Market**

	<b>2:20- 2:40p.m.</b>	<b>2:40- 3:00p.m.</b>	<b>Number of Broken Trades</b>
<b>Total Trades</b>	5,721,383	7,318,675	20,761
<b>Average Trade Size</b>	286.68	282.03	270.33
On NYSE	667,368	1,039,233	0
On Amex	4,154	6,965	4
On ARCA	886,899	1,110,765	4,903
On NASDAQ	1,482,761	2,052,647	12,306
On BATS	988,252	1,177,318	1,094
On CBOE	2,902	4,743	138
On ISE	87,313	171,978	403
On NASDAQ-BX	271,119	401,549	63
On National	35,386	58,085	27
On Chicago	5,845	10,748	7
On ADF/TRF	1,287,489	1,101,252	1,816

Sources: NYSE, NSYEAmer, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA

Table 6: Percentage of Trades Executing on Each Market

	2:20- 2:40p.m.	2:40- 3:00p.m.	Percentage of Broken Trades
<b>Total Trades</b>	5,721,383	7,318,675	20,761
<b>Average Trade Size</b>	286.68	282.03	270.33
On NYSE	11.70%	14.60%	0.00%
On Amex	0.10%	0.10%	0.00%
On ARCA	15.50%	15.60%	23.60%
On NASDAQ	25.90%	28.80%	59.30%
On BATS	17.30%	16.50%	5.30%
On CBOE	0.10%	0.10%	0.70%
On ISE	1.50%	2.40%	1.90%
On NASDAQ-BX	4.70%	5.60%	0.30%
On National	0.60%	0.80%	0.10%
On Chicago	0.10%	0.20%	0.00%
On ADF/TRF	22.50%	15.40%	8.70%

Sources: NYSE, NYSEAmex, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA

We continue to analyze the distribution of broken trades across markets to determine whether differences in market structure may have had an impact. Because NYSE pauses or slows trading in volatile periods when a LRP is triggered, this likely explains why NYSE had no broken trades on May 6. Some have suggested that LRPs exacerbated price volatility on May 6 by causing a net loss of liquidity as orders were routed to other trading venues for immediate execution rather than wait on the LRP mechanism. If accurate, this potentially could cause some NYSE securities to decline further than the broad market decline. Others believe that the LRP mechanism served to attract additional liquidity that helped soak up some the excess selling interest in these securities on May 6. In any event, nearly 83% of the securities with broken trades do not trade on NYSE, as NYSE trades only NYSE-listed stocks, and thus could not have been directly affected by NYSE LRPs. A determination of the extent to which the use of LRPs by NYSE contributed to the volatility on May 6 requires further study.

Also worth noting is the relatively low number of broken trades on BATS, relative to its share of trading volume. Although more study is required, one explanation for this could be that BATS does not refresh “stub quotes.” The SEC staff is reviewing the extent to which the use of stub quotes contributed to the volatility on May 6, and is considering possible policy responses.

Table 7: Broken Trades by Time Period - May 6, 2010

Description	Before 2:40	2:40 - 2:45	2:45 - 2:50	2:50 - 2:55	2:55 - 3:00	After 3:00	Total
<b>Panel A: All Broken Trades</b>							
# of Broken Trades	209	91	11,446	4,703	2,011	2,301	20,761
> 14:40 price	20	1	156	1,130	95	2,158	3,560
< 14:40 price	189	90	11,290	3,573	1,914	143	17,201
> 160% of 14:40 price	13	0	156	1,130	93	1,011	2,403
< 40% of 14:40 price	186	90	11,290	3,572	1,914	143	17,195
< 5¢	148	6	5,158	1,928	175	1	7,416
Share Volume (x000)	37	57	3,165	1,136	636	582	5,612
\$ Volume (by 14:40 pm price in \$MM)	1.3	2.1	132.4	29.3	17.6	29.7	212.4
Return from 14:40 price (weighted)	245%	-97%	-93%	-41%	119%	2976%	262%
<b>Panel B: Broken Trades that are Short Sales</b>							
% of Broken Trades	16.3%	4.4%	42.0%	52.6%	12.1%	54.2%	42.4%
> 14:40 price	20.0%	0.0%	4.5%	45.1%	2.1%	57.7%	49.7%
< 14:40 price	15.9%	4.4%	42.5%	55.0%	12.6%	1.4%	40.9%
> 160% of 14:40 price	15.4%	0.0%	4.5%	45.1%	2.2%	50.0%	42.7%
< 40% of 14:40 price	16.1%	4.4%	42.4%	54.7%	12.6%	1.4%	40.8%
< 5¢	20.3%	0.0%	70.9%	90.1%	39.4%	0.0%	74.0%
Share Volume (% of Broken Trades)	9.8%	3.0%	19.0%	36.7%	12.2%	50.4%	24.9%
\$ Volume (% of Broken Trades)	6.0%	1.8%	14.5%	30.3%	9.5%	54.8%	21.7%
Return from 14:40 price (weighted)	-76%	-97%	-92%	-21%	-95%	81%	-35%

Source: All trade data from SROs. Price data from NYSE Trades and Quotes.

Table 7 shows that, during the core 2:40 p.m. to 3:00 p.m. period, broken trades peaked between 2:45 p.m. and 2:55 p.m., with 11,446 broken trades executed from 2:45 p.m. to 2:50 p.m. and 4,703 broken trades executed between 2:50 p.m. and 2:55 p.m. As expected, this corresponds with the period of peak volatility and trading volume in the securities markets.

Table 7 also shows the number of trades that occurred at extraordinarily low prices – five cents or less – which indicates an execution against a “stub” quote of a market maker. A total of 7,416 of these trades took place during the core 2:40 p.m. to 3:00 p.m. period, with the highest levels occurring, as expected, between 2:45 p.m. and 2:50 p.m. (5,158) and 2:50 p.m. and 2:55 p.m. (1,928).

Table 7 further shows the number of broken trades identified as short sales. During the period of peak market volatility, 2:45 p.m. to 2:55 p.m., the broken trades executed at five cents or less were primarily short sales. Short sales account for approximately 70.1% of executions against “stub” quotes between 2:45 p.m. and 2:50 p.m., and approximately 90.1% of executions against “stub” quotes between 2:50 p.m.

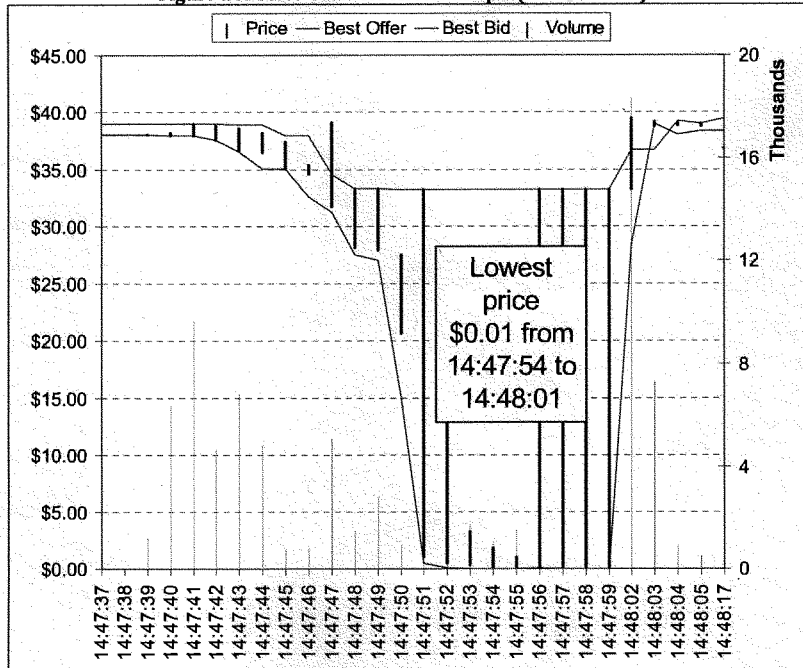
and 2:55 p.m. It is worth noting that short sale executions against stub quotes at or below the prevailing national best bid would be subject to the alternative uptick rule (Rule 201) adopted by the SEC on February 24, 2010, with a compliance date of November 10, 2010.<sup>24</sup> The SEC staff is continuing to review short selling activity on May 6, including the apparent high level of short selling against “stub” quotes during the period of peak market volatility.

Figure 8 shows that these stub quote executions occurred in more than 200 securities, across large, medium and small capitalization stocks, but with a concentration in small capitalization securities. Although more study is required, the higher level of stub quote executions in smaller capitalization securities is consistent with their tendency to have less liquidity, and thus a greater likelihood that selling interest could overwhelm order books in times of heightened volatility. As noted above, the SEC is reviewing the extent to which the use of stub quotes contributed to the volatility on May 6, and is considering possible policy responses.

One example of a security where there were executions against stub quotes is Accenture (ACN). The data set forth below indicates that share prices of Accenture fell from nearly \$40 to a penny and recovered all of their value within a matter of seconds. We are investigating this dramatic spike to determine possible causes and explanations, including its relation to the broader market disruption.

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<sup>24</sup> Under Rule 201, trading centers will be required to have and enforce policies and procedures reasonably designed to prevent executions of short sales at or below the national best bid once the stock price has experienced a ten percent decline relative to the prior day’s closing price.

Figure 14: Price Chart for Accenture plc (Ticker = ACN)<sup>25</sup>

Source: All data from NYSE Trades and Quotes

The figure above shows that bids for Accenture plc (ACN) rapidly declined in 7 seconds from about \$30 at 2:47:47 p.m., to \$0.01 by 2:47:54 p.m.. The black bars show that trades were being made at both the stub quote of \$0.01 and the ask price of over \$30 within the same second.

**ETFs:** As previously discussed, the data suggests that ETFs as a class were affected more than any other category of securities. Trades in securities issued by ETFs appear to have accounted for nearly 70% of the securities in which trades were broken on May 6. Figure 15 shows the distribution of ETF daily lows during May 6. A relatively large number of ETFs, approximately 160, experienced lows during the day approximately 100% lower than the May 5 close, represented by the spike on the left-

<sup>25</sup> This chart and the others below depicting single security price charts plot the second-by-second activity of trades, quotes, and volume for the security indicated. Each thick vertical bar (in black) shows the high/low range of all prices executed for all trades within a given second (scale on left axis). The red line shows the lowest National Best Bid quoted across all exchanges during that second. The green line shows the highest National Best Offer quoted across all exchanges during that second. The thick blue vertical lines indicate the total volume of shares traded each second (scale on right axis).



hand side of the figure. A significant number of ETFs also experienced less extreme, but still notable lows of between 35% and 100% relative to their corresponding May 5 close.

A larger cluster of ETFs experienced lows approximately 8% below May 5 close. This clustering of daily lows around -8% is consistent with the daily low in the broader market, which was approximately 8.5% for the S&P 500. However, relative to the distribution of losses of all securities, (depicted above in Figure 8), extreme daily lows appear to have been more common in the ETFs (as depicted in Figure 15). Figure 15 does not reveal an obvious relation between ETF market capitalization and daily lows.

Tables 8 and 9 report the total number of trades, the total volume and total dollar volume for ETF trades executed between 2:40 p.m. and 3:00 p.m., for losses and gains, respectively. The tables are based on 838 registered ETFs as derived from Morningstar. The losses/gains are computed as the difference between the trade price and the 2:40 p.m. price, divided by the 2:40 p.m. price, for each stock. The data do not include out-of-sequence trades.

**Table 8: Trades Executed at a Loss**

	<b>Total # trades</b>	<b>Total volume</b>	<b>Total volume (\$)</b>
All trades	1,265,637	456,335,890	22,381,572,444
Losses	794,607	279,836,213	14,135,649,267
0% to -10%	761,866	269,307,656	13,909,304,917
-10% to -20%	13,607	3,988,959	145,247,171
-20% to -30%	3,714	1,144,431	40,234,001
-30% to -40%	2,041	753,856	18,934,582
-40% to -50%	1,151	320,661	6,612,612
-50% to -60%	1,148	344,774	7,657,548
-60% to -70%	758	314,030	4,111,592
-70% to -80%	505	233,617	2,021,741
-80% to -90%	775	176,632	1,025,499
-90% to -100%	9,042	3,251,597	499,604

Source: NYSE's Trades and Quotes

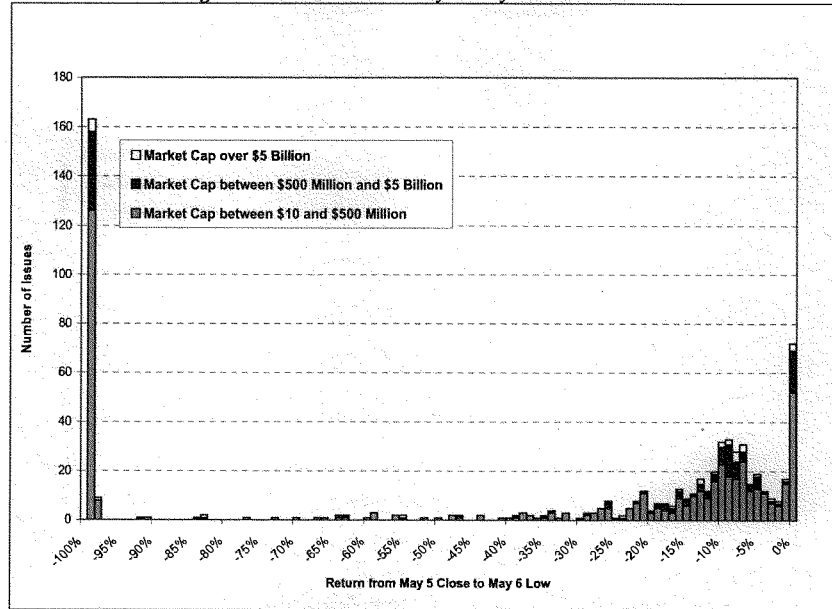
**Table 9: Trades Executed at a Gain**  
**Total #**      **Total volume**      **Total volume (\$)**  
**trades**

All trades	1,265,637	456,335,890	22,381,572,444
Gains	471,030	176,499,677	8,245,923,177
0% to 10%	468,197	175,697,855	8,221,468,066
10% to 20%	2,392	712,398	18,350,149
20% to 30%	99	30,162	1,330,565
30% to 40%	28	6,668	240,300
40% to 50%	35	4,300	184,047
50% to 60%	12	1,600	77,897
60% to 70%	19	5,996	266,038
70% to 80%	30	5,166	511,016
80% to 90%	41	4,500	450,227
> 90%	177	31,032	3,044,872

Source: NYSE Trades and Quotes

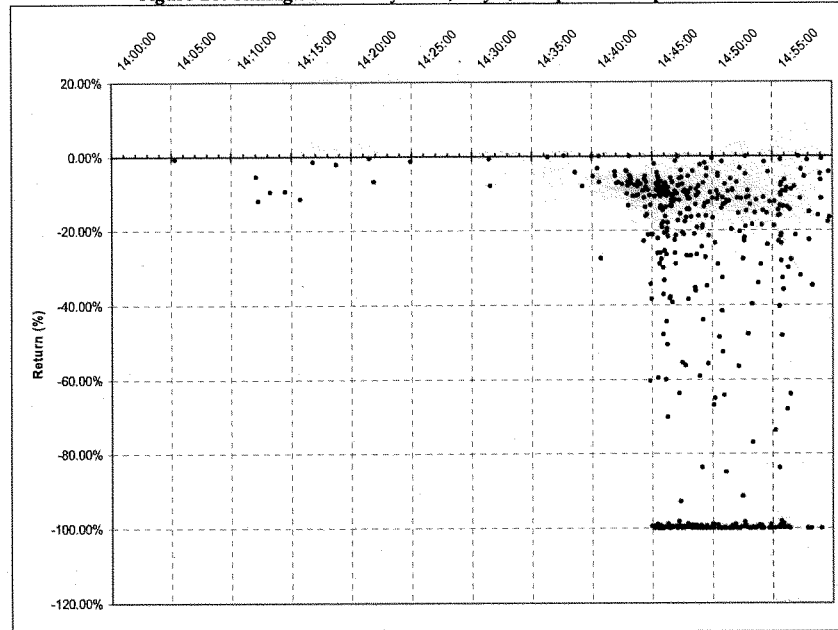
Table 8 indicates that, out of the 280 million ETF shares that traded below the 2:40 p.m. price, approximately 269 million, or 96%, traded at prices above or within 10% of the 2:40 p.m. price. A significant number of shares, approximately 3 million, traded at 90-100% losses. Dollar volume for trades at 90-100% losses is low, at \$499,600, but purely as a mechanical consequence of low share prices. Significantly fewer shares of ETFs traded at large gains than traded at large losses. Table 9 indicates that only 712,398 shares traded at gains of 10% to 20%. In the aggregate, approximately 800,000 shares, with a dollar volume of \$24.5 million, traded at a more than 10% gain.

Figure 15 indicates the distribution of ETF daily lows during May 6. A relatively large number of ETFs, approximately 160, experienced lows during the day approximately 100% lower than the May 5 close, represented by the spike on the left-hand side of the figure, and a number of ETFs also experienced less extreme, but still notable, lows between, 35% and 100% below the May 5 close. A larger cluster of ETFs experienced lows approximately 7% below the May 5 close, a concentration that may be a byproduct of the temporary dislocation in the broad market. In some ETFs, daily lows were approximately the same as the May 5 close, represented by the modest spike on the right-hand side of the chart. Relative to the distribution of all securities, depicted above in Figure 8, extreme daily lows appear to have been more common in the ETFs.

Figure 15: Distribution of May 6 Daily Lows for ETFs<sup>26</sup>

Sources: Thomson Financial Datastream and NYSE Trades and Quotes.

<sup>26</sup> Figure 15 depicts the distribution of returns from close on May 5 to the lowest transaction price on May 6. The securities included are ETFs trading on major U.S. exchanges, with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close.

Figure 16: Timing of ETF Daily Lows, May 6, 2:00pm to 3:00 pm<sup>27</sup>

Sources: Thomson Financial Datastream and NYSE Trades and Quotes

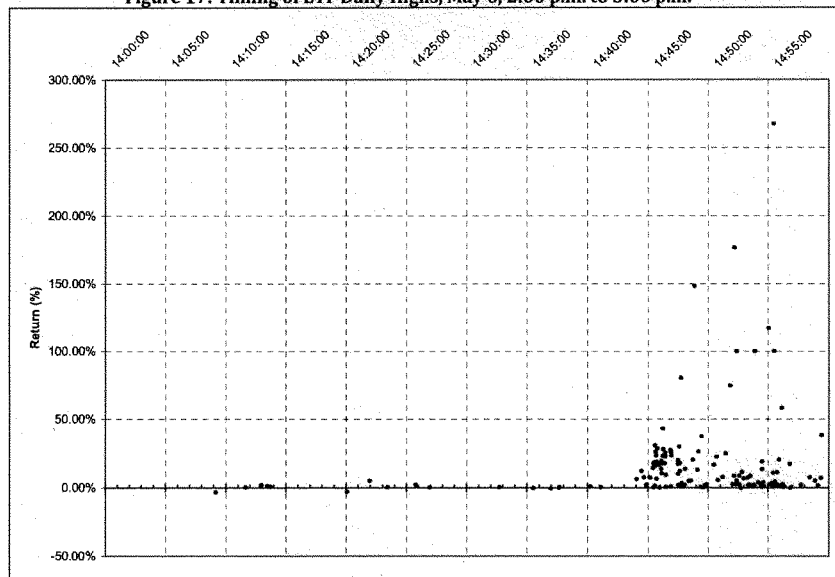
Over the one-hour interval between 2:00 p.m. and 3:00 p.m., as shown in Figure 16, many of the daily lows in ETFs occurred after 2:45 p.m. A few ETFs began experiencing relatively modest daily lows of approximately 10% below the May 5 close shortly after 2:10p.m. These lows continued sporadically until around 2:40p.m., when their frequency increased, represented on the graph by the concentration of points on the lower right. Many of these daily lows, beginning near 2:45p.m., were approximately 100% below the May 5 close, represented by the dense line near -100% on the right-hand side of the graph. Comparing this figure with Figure 10, which presents the same analysis for all securities, ETFs appear relatively less likely than other securities to have experienced extreme daily lows during the early part of the hour.

While many ETFs experienced extreme daily lows during the day, as evidenced by the daily lows presented in Figure 16, a significant number of ETFs experienced

<sup>27</sup> Figure 16 depicts the timing of ETF daily lows during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the lowest transaction price on May 6, plotted against the time at which the transaction occurred. Daily lows not occurring during this one-hour interval are not depicted. The figure includes ETFs trading on major U.S. exchanges with a share price of more than \$3.00 and a market capitalization of at least \$10 million as of the May 5 close.

extreme daily highs. Figure 17 presents these daily highs, plotted against the time at which they occurred. One ETF experienced a daily high approximately 275% higher than the May 5 close. Consistent with the pattern for extreme daily lows, the extreme daily highs appear to begin near 2:45 p.m. and are notably absent from the early part of the hour.

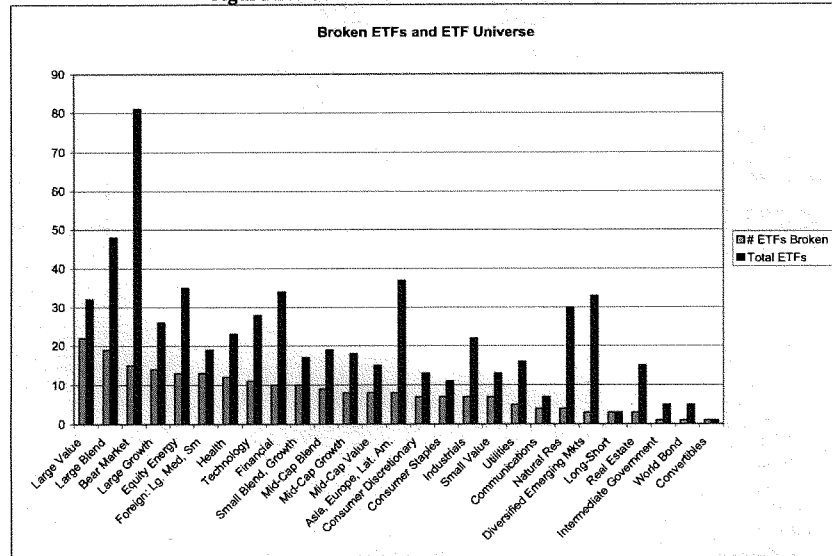
**Figure 17: Timing of ETF Daily Highs, May 6, 2:00 p.m. to 3:00 p.m.<sup>28</sup>**



Sources: Thomson Financial Datastream and NYSE Trades and Quotes

Figure 18 depicts the number of broken-trade ETFs and the total number of ETFs, broken out by asset category. This behavior is very similar to that previously depicted for individual companies.

<sup>28</sup> Figure 17 depicts the timing of ETF daily highs during the one-hour period from 2:00 p.m. to 3:00 p.m. on May 6. Each point represents the return from the May 5 close to the highest transaction price on May 6, plotted against the time at which the transaction occurred. Daily highs not occurring during this one-hour interval are not depicted. The Figure includes ETFs trading on major U.S. exchanges with a share price of more than \$3.00 and a market capitalization of at least \$10 million.

**Figure 18: Broken-Trade ETFs and ETF Universe**

Source: NYSE, NYSEAmex, NYSE Arca, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, NSX, Chicago Stock Exchange and FINRA

Tables 10, 11 and Figure 18 present summary statistics on broken trades by fund company, by net assets, and by asset class. Figure 18 illustrates the relation between fund investment objective and the existence of broken trades. It depicts the distribution of total ETFs and ETFs with broken trades by asset category. The broken trades are skewed toward large- and mid-cap equity ETFs, with fewer broken trades occurring in bond, real-estate and ETFs with objectives that do not track the overall market.

Table 10 classifies broken-trade exchange-traded funds by fund family. All but ten of the exchange-traded products with subsequently broken trades were also ETFs, and five of those ten appear to be stock-related ETPs. Table 10 indicates that, on average, 27.1% of all fund companies experienced broken trades. There is, however, considerable cross-sectional variation among fund families. For example, First Trust experienced broken trades in approximately 50% of its ETFs, while PIMCO had no ETFs with broken trades.<sup>29</sup>

One explanation for this variation may be the degree to which families specialize in asset classes that had fewer breaks, such as debt-oriented fund families like PIMCO. It is clear that the breaks occurred in many trades of ETFs in fund families (16 of 26 fund

<sup>29</sup> Additionally, one fund family appears to account for all five of the commodity-index-related non-ETF ETPs that experienced broken trades

families) and that, conditional on a break occurring within a particular fund family, not all of the ETFs were affected.

Table 11 examines the relation between ETF size and broken trades by net asset quartile. The data suggests that the proportion of broken trades in the smallest net asset quartile of ETFs is lower than the others (16.3% versus 30.7%).<sup>30</sup> Table 11 also indicates that while there are differences across quartiles, the relative volume of broken trades to non-broken trades within each quartile did not change very much between May 5 and May 6. For example, the May 5 ratio of daily volume of funds that had broken trades on May 6 to those without broken trades was 63.8% ( $46,115/(46,115+26,138)$ ). The analogous ratio computed using May 6 volume levels is very similar at 61.7% ( $28,034/(28,034+17,385)$ ).

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<sup>30</sup> The rate of broken trades for Average Current Net Asset Quartile 1 of 16.3% is computed as  $34/(34+175)$ . An analogous calculation is used to compute the average across the other three quartiles.

Table 10: Fund Companies<sup>31</sup>

ETF Firm Name	Broken	Not Broken	Total
ALPS ETF	0	6	6
AdvisorShares	0	1	1
Claymore Securities	9	25	34
Direxion Funds	3	31	34
Emerging Global	0	6	6
FaithShares	1	4	5
Fidelity Investments	1	0	1
First Trust	21	22	43
Global X Funds	0	10	10
Grail Advisors	0	7	7
IndexIO	2	6	8
JETS	0	2	2
OOK Advisors	0	2	2
Old Mutual	0	4	4
PIMCO	0	10	10
PowerShares	43	73	116
ProShares	22	77	99
Rydex/SGI	17	14	31
Schwab Funds	5	3	8
State Street Global	14	76	90
VTL Associates, LLC	2	4	6
Van Eck	2	23	25
Vanguard	15	31	46
WisdomTree	9	33	42
XShares	0	5	5
iShares	61	136	197
<b>Total</b>	<b>227</b>	<b>611</b>	<b>838</b>
<b>Percent of Total</b>	<b>27.1</b>	<b>72.9</b>	<b>100.0</b>

Source: NYSE, NYSEAmex, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, NSX, Chicago Stock Exchange and FINRA

<sup>31</sup> Table 10 presents the number of ETPs with broken trades on May 6, 2010 by fund family (sponsor).



Table 11: ETFs with Broken Trades<sup>32</sup>

	Quartile Average Current Net Assets <sup>33</sup>	Number of ETFs	Average Daily Volume May 6	Average Daily Volume May 5	Average Current Net Asset
Broken	1	34	46,115	28,034	\$8,321,632
Not Broken	1	175	26,138	17,385	\$7,690,493
Broken	2	60	150,390	76,880	\$42,167,498
Not Broken	2	150	99,232	60,952	\$37,411,891
Broken	3	76	265,000	192,501	\$188,958,576
Not Broken	3	133	1,316,488	856,819	\$177,878,106
Broken	4	57	5,962,890	3,355,924	\$2,586,658,099
Not Broken	4	153	20,746,803	11,972,562	\$3,463,601,150

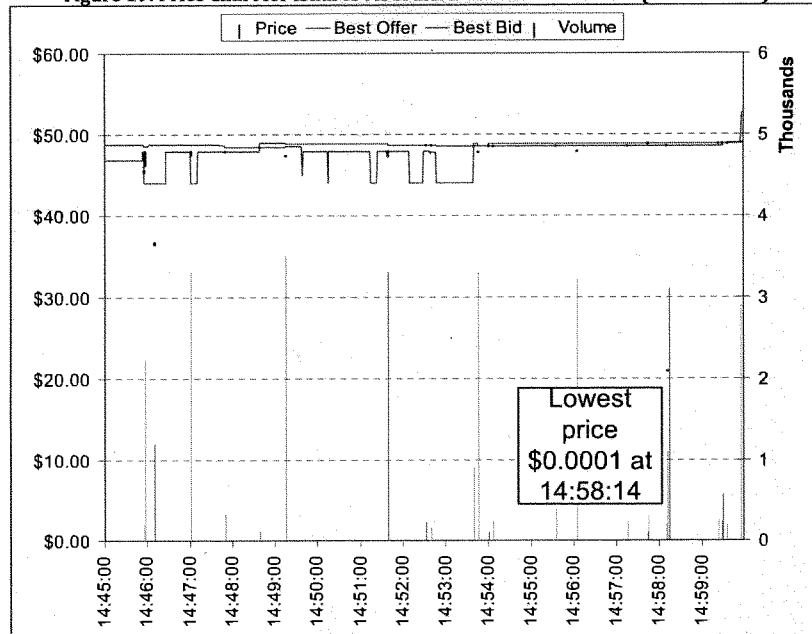
Sources: Morningstar is the source of current net asset data and Datastream is the source of the average daily volume data

The next three charts show the experience of broken trades in three different ETFs.

<sup>32</sup> This presents the number of ETFs by quartile of average current net assets, with broken trades on May 6, 2010 out of all ETFs, the average daily volume for ETFs for May 5, 2010 and May 6, 2010, and the average net assets of registered ETFs.

<sup>33</sup> ETFs in quartile 1 have current net assets less than \$16,312,382. Quartile 2 has ETFs with current net assets between \$16,312,382 and \$75,170,606. Quartile 3 has ETFs with current net assets between \$75,170,606 and \$351,622,059. Quartile 4 consists of ETFs with current net assets greater than \$351,622,059.

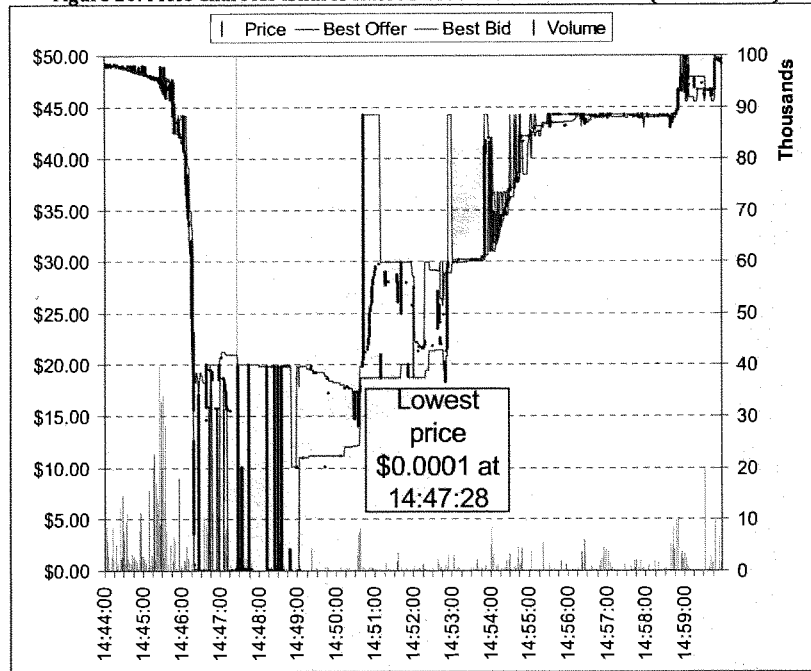
Figure 19: Price Chart for iShares MSCI EAFE Growth Index Fund (Ticker = EFG)



Source: NYSE Trades and Quotes

Figure 19 shows that iShares MSCI EAFE Growth Index Fund (EFG) was thinly traded but within a relatively narrow bid-ask spread. However, a number of trades are executed below the lowest national best bid, and at 2:58:14 p.m. transactions are executed at prices of less than \$0.01.

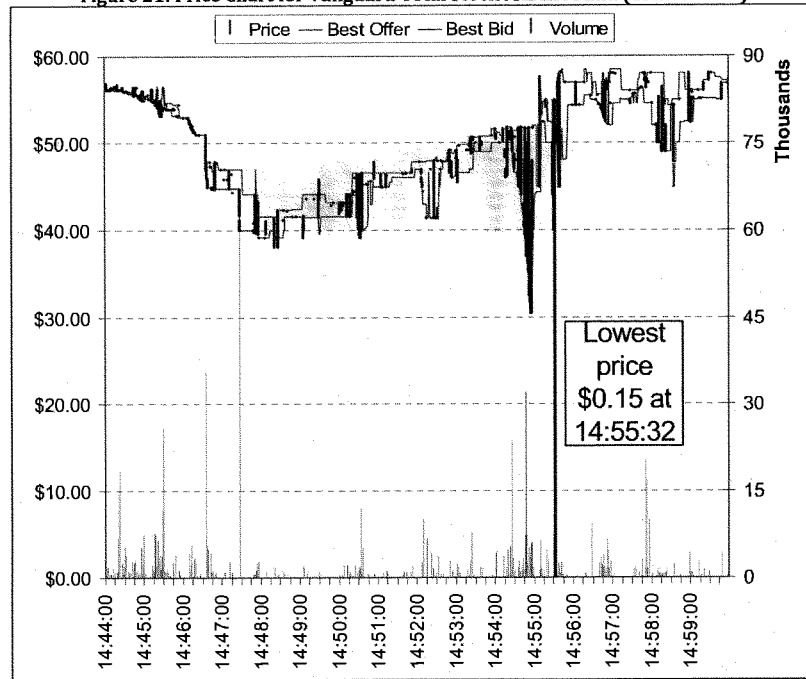
Figure 20: Price Chart for iShares Russell 1000 Growth Index Fund (Ticker = IWF)



Source: NYSE Trades and Quotes

In Figure 20, bids for iShares Russell 1000 Growth Index Fund (IWF) rapidly declined just before 2:46 p.m. A number of trades were executed at stub-quotes of less than \$0.01 and at the highest offer-quote of \$20.00 within a 3-minute period, which was followed by a two-minute period with almost no trade activity. IWF then slowly recovered with widely varying bid and offer quotes. By 2:56 p.m. the bid-ask spread narrows and the price increased to approximately 90% of its decline.

Figure 21: Price Chart for Vanguard Total Stock Market Fund (Ticker = VTI)



Source: NYSE Trades and Quotes

Figure 21 indicates that Vanguard Total Stock Market Fund (VTI) maintained relatively narrow bid-ask spreads while following the broad market through decline and recovery beginning 2:44 p.m. Just prior to 2:55 p.m., bids suddenly collapsed on increased volume well after the recovery is underway. And at 2:55:32 p.m. bids drop to stub quotes and trades are executed at \$0.15 before the price resumes its recovery.

For reference, the tables below rank the top 10 ETFs with broken trade and stocks (by volume, both for the full day and between 2:00 p.m. and 3:00 p.m. on May 6).

**Table 12: Top 10 ETFs with Broken Trades by Trading Volume – Full Day, May 6**

ETF	Ticker	Volume
iShares Russell 2000 Index	IWM	195,387,906
ProShares UltraShort QQQ	QID	53,291,398
iShares Russell 1000 Growth Index	IWF	9,002,900
ProShares Ultra Real Estate	URE	6,983,600
iShares Russell 2000 Value Index	IWN	6,823,200
iShares Russell 1000 Value Index	IWD	6,258,200
Vanguard Total Stock Market ETF	VTI	6,160,500
iShares S&P MidCap 400 Index	IJH	5,416,800
iShares Russell 1000 Index	IWB	5,194,400
Rydex S&P Equal Weight	RSP	4,511,600

Sources: NYSE, NSYEAmax, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.

**Table 13: Top 10 ETFs with Broken Trades by Trading Volume – May 6 from 2 p.m. to 3 p.m.**

ETF	Ticker	Volume
iShares Russell 2000 Index	IWM	58,392,711
ProShares UltraShort QQQ	QID	21,771,521
iShares Russell 1000 Growth Index	IWF	3,161,501
iShares Russell 2000 Value Index	IWN	2,671,281
Vanguard Total Stock Market ETF	VTI	2,472,422
Rydex S&P Equal Weight	RSP	2,305,135
ProShares Ultra Real Estate	URE	2,193,949
iShares Russell 1000 Value Index	IWD	1,707,294
iShares Russell 1000 Index	IWB	1,677,658
iShares S&P MidCap 400 Index	IJH	1,407,322

Sources: NYSE, NSYEAmax, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.

**Table 14: Top 10 Broken Stocks by Trading Volume – Full Day May 6**

Stock	Ticker	Volume
Radian Group	RDN	70,612,297
Apple Inc.	AAPL	45,923,602
Philip Morris International	PM	16,460,300
Exelon Corp	EXC	12,426,400
Amylin Pharmaceuticals	AMLN	11,626,099
Costco Warehouse	COST	11,175,900
International Group of Companies	IPG	11,073,400
Accenture, PLC	ACN	10,311,600
Amazon	AMZN	10,195,600
CenterPoint Energy	CNP	9,322,800

Sources: NYSE, NYSEAmex, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.

**Table 15: Top 10 Broken Stocks by Trading Volume – May 6 from 2 p.m. to 3 p.m.**

Stock	Ticker	Volume
Apple Inc.	AAPL	7,506,380
Radian Group	RDN	5,298,708
Philip Morris International	PM	4,140,829
International Group of Companies	IPG	3,235,083
Provident Energy Trust	PVX	2,622,676
Exelon Corp	EXC	2,509,121
CenturyTel, Inc	CTL	2,248,034
Accenture, PLC	ACN	2,059,138
Center Point Energy	CNP	2,018,251
Southwestern Energy Company	SWN	1,618,107

Sources: NYSE, NYSEAmex, NYSEARCA, NASDAQ, BATS, CBOE Stock Exchange, ISE, NASDAQ-BX, National Stock Exchange, Chicago Stock Exchange and FINRA.

SEC staff also evaluated whether creation and redemption behavior by authorized participants was significantly different on May 5, 6 and 7 between ETFs with broken trades and ETFs without broken trades. The staff was provided creation and redemption data by four ETF advisors. The data contained daily creation and redemption units or shares for all ETFs advised by those firms from approximately April 1 to May 11. Two ETF advisors provided their information in number of shares, while two provided theirs in number of units. Since shares and units are not directly comparable, the two data sets were combined separately in order to run the analysis. Statistical tests were run to determine whether the amount of net creations (creations minus redemptions) differed between ETFs that experienced broken trades and those that did not. The tests were run on creation and redemption data separately for May 5, May 6, and May 7.

The results of the tests do not provide evidence that there was a significant difference in the creation and redemption behavior of authorized participants between ETFs with broken trades and ETFs without broken trades. There are some statistically significant results indicating that ETFs with broken trades had higher creations on May 7 than ETFs without broken trades, although the level of significance is weak. As a robustness check, the same tests were run on all days not including May 5, May 6 and May 7. The results showed that there is no statistical difference in creation and redemption behavior of authorized participants between ETFs with broken trades and ETFs without broken trades during the trading window not including May 5, May 6 or May 7. It is noted that the tests were completed with very small sample size, limiting their power.

The SEC staff continues to investigate precisely why ETFs as a class were affected so dramatically. ETFs are primarily highly transparent pools of securities that seek to track market indices. Thus, unlike other listed securities, the value of an ETF is dependent on the value of the individual securities it owns as well as the transactions in ETF shares by market participants. ETFs are often used by investors and other market participants as an efficient means of gaining (or reducing) exposure to market segments in connection with their implementation of investment or hedging strategies.

As discussed in Appendix A, ETF shares have typically traded at market prices that are closely related to the net asset value of their shares. This pricing discipline principally hinges on the ability of market makers: (a) to effectively hedge their market exposure to ETF shares; and (b) to engage in arbitrage transactions with the ETFs if the market prices of the ETF shares deviate significantly from their net asset values.

As noted above, certain non-ETF securities experienced extreme daily lows earlier than certain ETFs during the one hour interval from 2:00 p.m. to 3:00 p.m. We are currently gathering and reviewing data to ascertain the causes of these collapses and the possible implications for the broader market.

We are also studying the extent to which the use of ETFs may have contributed to the abrupt price declines. For example, institutional investors often utilize index-based ETFs in hedging strategies, which may have prompted unusual liquidity demands during this period of market turmoil. The use of stop loss orders by other investors may have created additional sell pressure on ETF shares in a rapidly declining market.

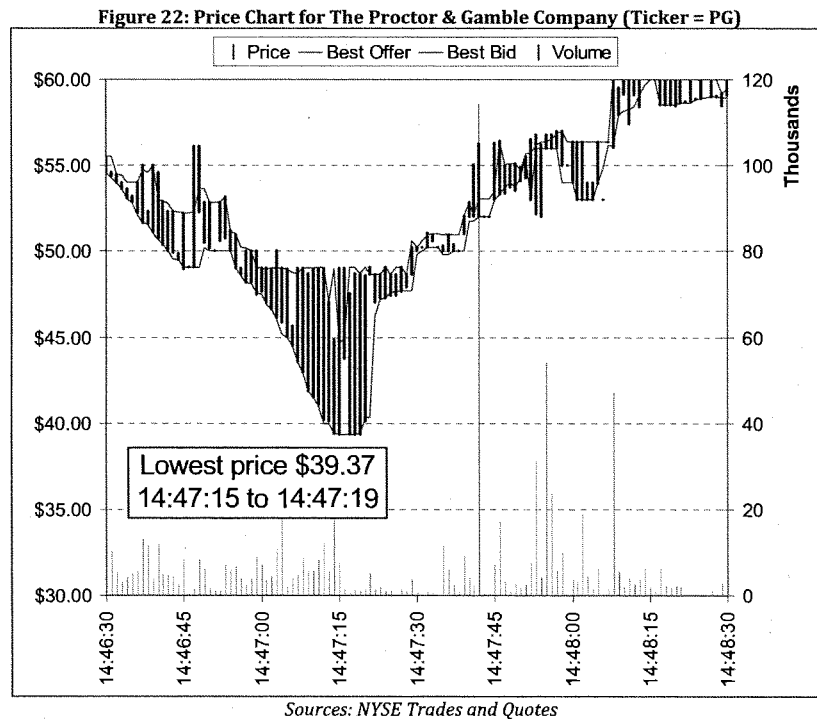
In addition, we are exploring the impact of “self-help” being invoked by NASDAQ and BATS against NYSE Arca. As NYSE Arca is the primary listing exchange for almost all ETFs, the loss of access to NYSE Arca’s liquidity pool may have had a disproportionate impact on market liquidity and trading for ETFs.

#### **b) Market Activity in Other Selected Securities**

Significant numbers of securities experienced declines in excess of the broad market (meaning, for these purposes, declines of more than 10% from their prices at 2:40

p.m.), but did not cross the 60% broken trade threshold. In addition, a significant number of securities experienced extreme daily highs after approximately 2:44 p.m.<sup>34</sup> In this section, we provide examples of specific selected securities to illustrate how representative securities behaved during the critical minutes of May 6.

For example, some large capitalization securities declined quite substantially. One was Proctor & Gamble (PG), whose price chart for May 6 is set forth in Figure 22.



It can be seen that bids for PG decline rapidly over a one-minute period before rapidly ascending and then recovering. Trades occur in a wide range from the lowest national best bid in a given second to the highest national best offer in that same second.

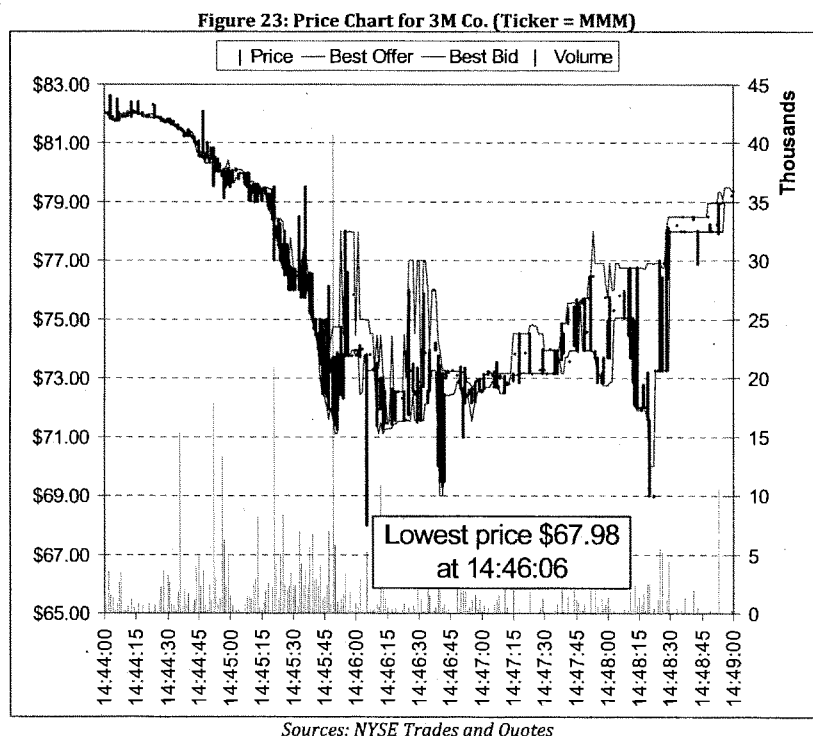
PG declined from more than \$60 to a low of \$39.37 in approximately 3.5 minutes (a 36.14% decline from the 2:40 p.m. price), then recovered above \$60 in approximately one minute. Notably, the decline in PG did not begin until 2:44 p.m., well after the

<sup>34</sup> In contrast to the stocks that suffered on the downside, the stock of Sotheby's (BID) is notable for displaying aberrant behavior on the upside on May 6 (see Figure 25 and Figure 26).



broader market indices, which began their precipitous drop at approximately 2:40 p.m. Accordingly, early reports that an inordinately large trade in PG may have triggered the broad market decline do not appear well founded. Our analysis of the order book data should help shed light on why PG declined and recovered so much more significantly than other large capitalization stocks.

Another large capitalization stock that declined substantially was 3M Co. (MMM), whose price chart is shown in Figure 23.



The bid-ask spread for MMM stays quite narrow, and volume remains significant, even as the price declines from about \$82 at 2:44 p.m. to a low of approximately \$68 at 2:46 p.m. Prior to reaching this low, the bid-ask spread over any given second dramatically widens and remains erratic before beginning a slow and choppy recovery.

MMM first declines from approximately \$82.50 at 2:44 p.m. to approximately \$71.00, then slowly begins to recover. Though this 14% decline was substantial, at approximately 2:48 p.m., the price declines sharply for a second time and hits a daily low

of \$67.98, resulting in a total decline from its 2:40 p.m. price of 18.39%, second only to PG among DJIA stocks. The price then suddenly climbs within a few seconds to approximately \$77. As with PG, our analysis of the order book data should shed greater light on why MMM could appear to have recovered from the initial decline, then suffered such a sharp additional decline and rise.

**Figure 24: Price Chart for Eaton Vance Tax-Managed Buy-Write Opportunities Fund (Ticker = ETV)**

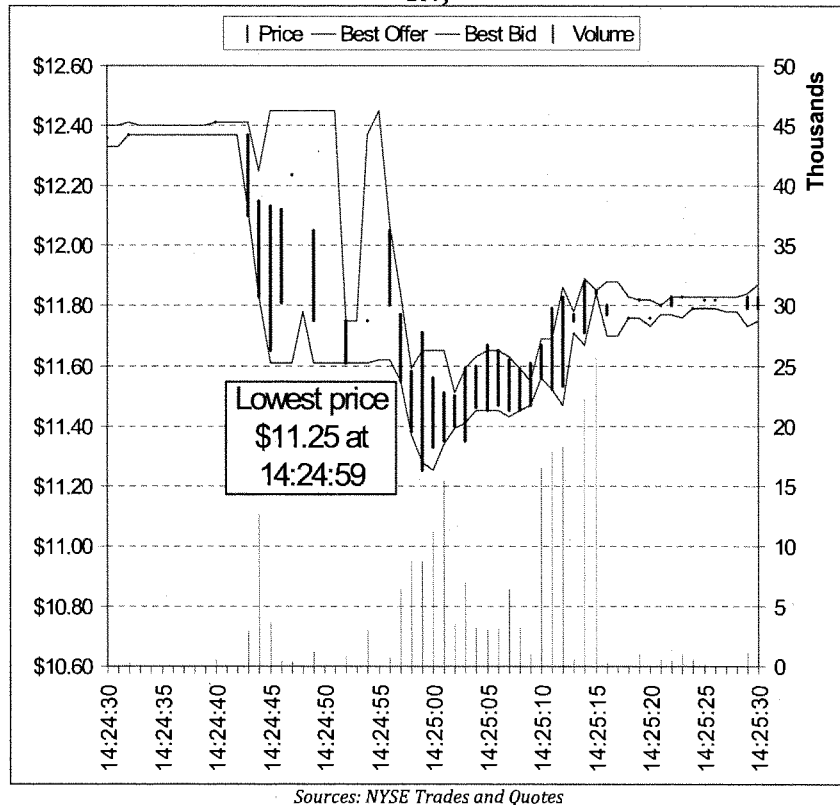
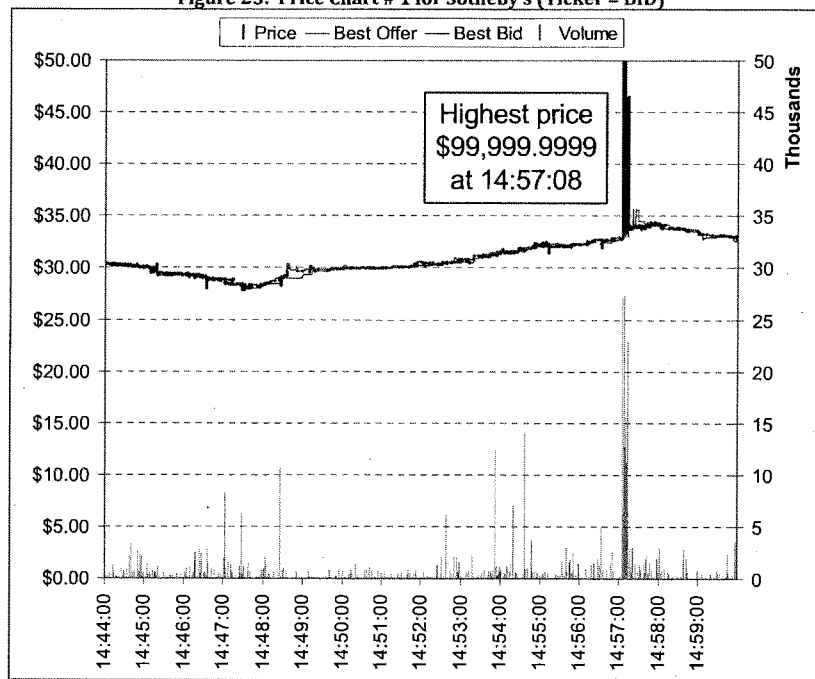


Figure 24 indicates that there is no activity in Eaton Vance Tax-Managed Buy-Write Opportunities Fund (ETV) from 2:24:30 p.m. through 2:24:43 p.m. at which time the bid drops by 6% rather quickly. Activity picks up again at about 2:24:57 p.m. as ETV partially recovers. This event occurred approximately 20 minutes prior to the main drop in broad markets.

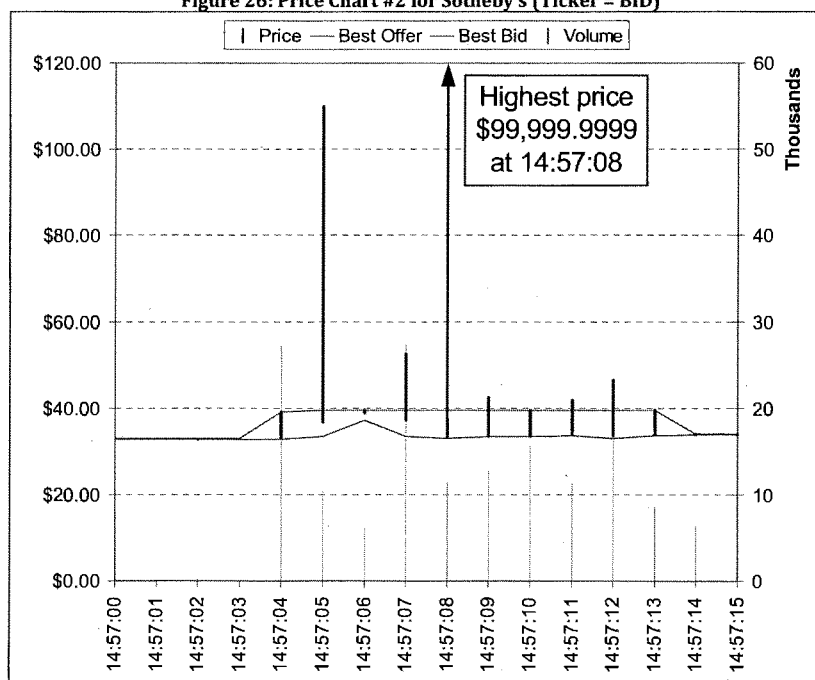
Figure 25: Price Chart # 1 for Sotheby's (Ticker = BID)



Sources: NYSE Trades and Quotes

In Figure 25, it can be seen that Sotheby's (BID) is actively traded and has a narrow bid-ask spread from 2:44 p.m. through 2:49 p.m. after which volume is low but bid and ask quotes remain stable. However, after about 2:57 p.m. volume spikes dramatically and trades are executed at a high (presumably stub) quote of approximately \$100,000. This event is plotted in more detail below.

Figure 26: Price Chart #2 for Sotheby's (Ticker = BID)

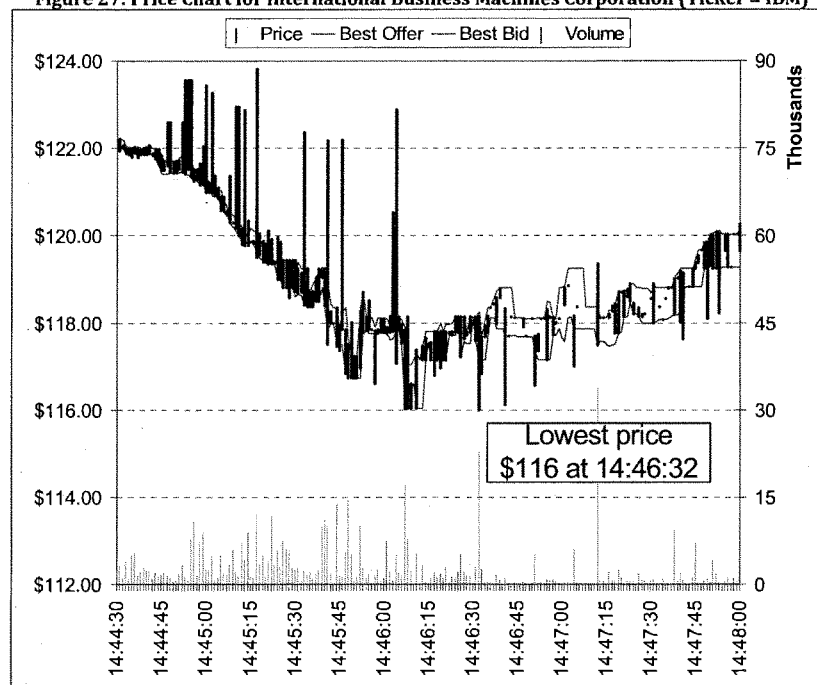


Sources: NYSE Trades and Quotes

As Figure 26 shows, BID trades through the national best offer multiple times between 2:57:05 p.m. and 2:57:12 p.m. This includes trades at approximately \$100,000 which is presumably a top-end stub quote. In contrast to the process in which bid-quotes for other stocks were shown to rapidly decline (which led to lower execution prices) here the highest offer price remained reasonable during a widening of the bid-ask spread, suggesting that the \$100,000 trade occurred deeper into the order book.

In contrast, many other stocks did not experience such substantial declines. Two such examples, IBM and Intel (INTC), are respectively shown below in Figures 27 and 28.

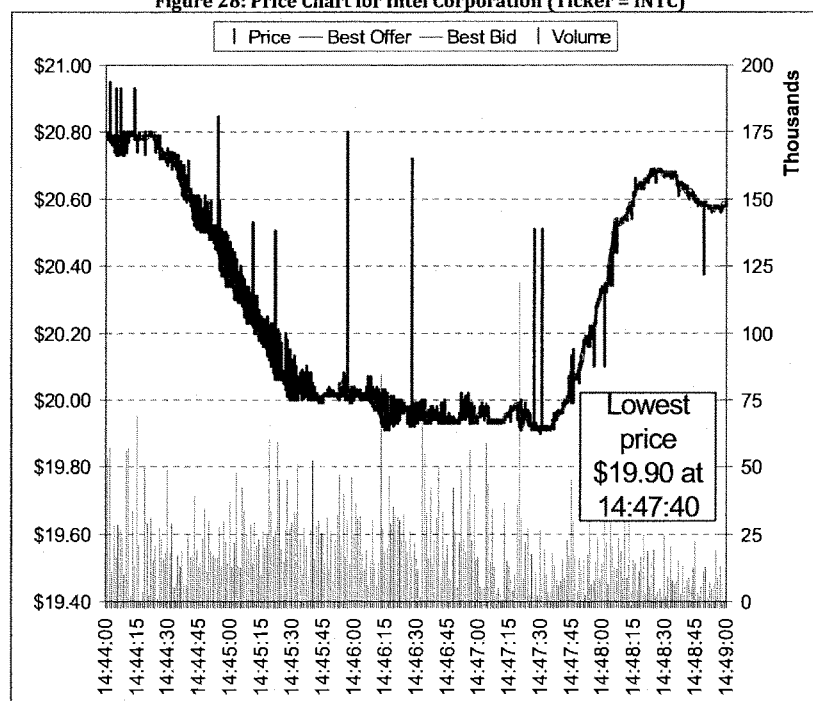
Figure 27: Price Chart for International Business Machines Corporation (Ticker = IBM)



Sources: NYSE Trades and Quotes

It can be seen that IBM trades down from \$122 at 2:44:30 p.m. to a low of \$116 (an approximate 5% loss) at 2:46:32 p.m. before rebounding to \$120 by 2:48:00 p.m. The upward spikes in trade execution represent prices that were above the highest national best offer suggesting that these trades occurred deeper in the order book. Note that activity during the recovery period shows trade prices below the national best bid, but with very low volume.

Figure 28: Price Chart for Intel Corporation (Ticker = INTC)



Sources: NYSE Trades and Quotes

As indicated above, INTC has constant volume and narrow bid-ask spreads throughout its moderate 4% decline, though the highest offer quote was sometimes breached on the up-side suggesting trades being executed deeper into the order book.

Table 16 presents summary information for each of the securities illustrated in the examples. The Historical Short Sale Ratio represents data from August 3, 2009 through April 23, 2010.<sup>35</sup> None of the May 6 Short Sale Ratios are more than 1.5 standard deviations away from their Historical Average.

<sup>35</sup> The "short sale ratio" is defined as the volume of short selling divided by total volume.

Table 16: Summary Data for Single-Security Plots

Stock Symbol	Listing Exchange	Event Type	Price (\$)	Time	Price at 2:00 p.m.	May 6 Short Sale Ratio	Historical Short Sale Ratio
ACN	NYSE	Low	0.01	14:47:54	41.78	33%	37%
BID	NYSE	High	100K	14:57:08	32.15	51%	49%
EFG	ARCA	Low	< 0.01	14:58:14	51.10	39%	39%
ETV	NYSE	Low	11.25	14:24:59	13.68	23%	32%
IBM	NYSE	Low	116.00	14:46:32	127.00	44%	41%
INTC	NASDAQ	Low	19.90	14:47:40	21.87	45%	48%
IWF	ARCA	Low	< 0.01	14:47:28	49.65	62%	45%
MMM	NYSE	Low	67.98	14:46:06	85.64	41%	41%
PG	NYSE	Low	39.37	14:47:15	62.52	45%	39%
VTI	ARCA	Low	0.15	14:55:32	56.88	43%	53%

We continue to evaluate any common drivers that might explain why trading for different securities exhibited different behaviors. Among a variety of factors, we are considering the effects of:

**Stop Loss Market Orders.** As described further below, stop loss orders have stop prices that, for sell orders, are lower than current prices. If prices fall, these orders are intended to prevent losses from exceeding a certain amount (beyond the stop price) by liquidating a long position in the stock. When the stop price is reached, such orders turn into market orders to sell. In fast market conditions, stop loss market orders may cause trades at prices that are much lower than the “stop” price anticipated by an investor, because the market may have moved by a significant amount before the order is executed. They also could potentially, under certain circumstances, trigger a chain reaction of automated selling if they are used in significant numbers for a particular stock. For example, the triggering of one stop loss market order can trigger an automated sell market order that causes a price decline that, in turn, in the absence of liquidity provision, may trigger another stop loss market order at a lower level, and so on.

**NYSE’s LRP Mechanism.** Another factor that we will examine closely is the effect of the NYSE’s LRP mechanism. As described further below, the NYSE’s trading system incorporates LRPs that are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of a sufficient size is reached. In such a case, trading on the NYSE will “go slow” and pause for a time period to allow an opportunity for additional liquidity to enter the market. During an LRP, the NYSE will display a quotation that is not immediately accessible and can be bypassed, but is not required to be bypassed, by other trading venues and order routers. Some have suggested that LRPs exacerbated price volatility on May 6 by causing a net loss of liquidity as orders were routed to other trading venues. If accurate, this potentially could cause some NYSE securities to decline further than the broad market decline. Others believe that the LRP mechanism served to

attract additional liquidity that helped soak up some of the excess selling interest in these securities on May 6. We are analyzing the effect of LRPs closely.

## **B. Futures Markets**

The CFTC staff has conducted a preliminary review of activity in the futures markets to better understand the events that took place on May 6, 2010. The objective was to collect and analyze preliminary evidence that might be associated with possible causes of the events that occurred in futures markets on May 6, 2010, including, but not limited to erroneous activities (*e.g.*, “fat finger” errors), cyber attacks, and significant system malfunctions. CFTC staff’s preliminary review has not, at this time, found evidence of erroneous activities, cyber attacks, or significant system malfunctions.

Preliminary findings suggest that a confluence of economic events, signals from various other markets, and a marked increase in sell orders (in comparison to buy orders) culminated in a significant dislocation of liquidity in the E-mini S&P 500 futures contracts.<sup>36</sup> This liquidity dislocation was also preceded by some reduction in activity of certain liquidity providers.

The analysis focuses on trading and liquidity provision in the June 2010 E-mini S&P 500 futures contract. That single contract month in the E-mini S&P 500 comprised 78.2 percent of the total volume of trading in the 12 most actively traded broad-based stock index futures contracts on May 6, 2010.

### **1. Background**

Consistent with broad market trends on May 6, 2010, trading volume in the E-mini S&P 500 futures was about 2.6 times greater than the average daily trading volume over the prior 30 days. On May 6, trading volume in the E-mini S&P 500 was the fifth highest daily volume over the past five years.<sup>37</sup>

Furthermore, the contract experienced a significantly higher level of trading during certain periods of the day. According to Figure 30, on May 6, the intraday-period-by-period trading volumes significantly exceeded the average trading volume for the same intra-day periods observed over the previous 30 days, especially between 2:00 p.m. and 3:30 p.m.

The daily trading activity did not result in a significant increase in the number of futures contracts held by market participants at the end of May 6, 2010. This implies many investors participated in the market intraday, but on balance few investors

<sup>36</sup> For more information on broad-based stock index futures, see Appendix B.

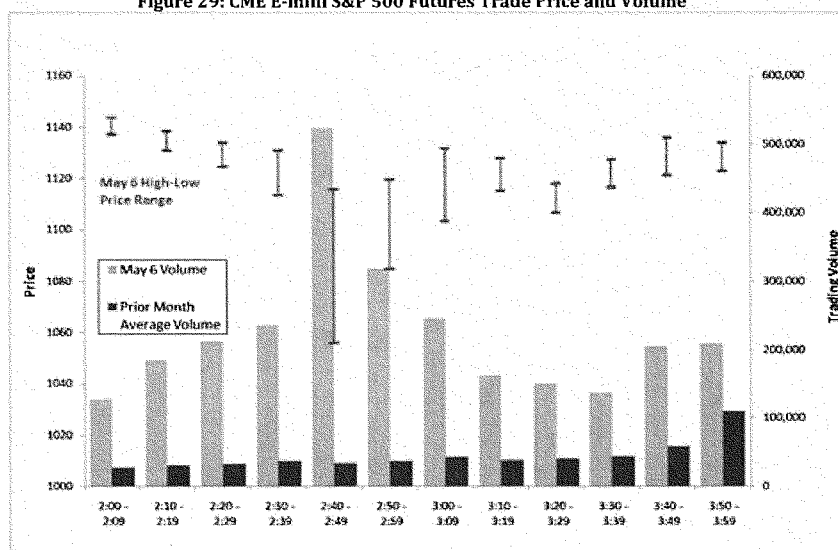
<sup>37</sup> Each of the four dates on which trading volume was greater occurred in September or October 2008, during the financial crisis. During the week of the Lehman bankruptcy filing on September 16, 17 and 18, 2008 trading volumes were 6.1 million contracts, 5.9 million contracts and 6.9 million contracts, respectively. On October 10, 2008 trading volume was 5.9 million contracts.



increased their position by the close of trading. Specifically, open interest in the June 2010 E-mini S&P 500 futures contract increased by only 3.74%, to 2,688,328 contracts; at this level, daily open interest on May 6, 2010 did not rank among the highest five days over the previous 5 years.<sup>38</sup> An increase in open interest means there is a cumulative increase in the size of the market participants' positions that remained open at the close of trading.

In line with broad market trends, high trading volume in the June 2010 E-mini S&P 500 contract on May 6, 2010 coincided with significant changes in prices (price volatility). The daily price range in the E-mini S&P 500 was 112.75 points. This represents the second widest daily price range over the past five years. The other four of the top five widest price ranges over the past five years occurred during the financial crisis in the autumn of 2008, including the single largest daily price range of 115.5 points on October 28, 2008. Within the trading day, the widest range between high and low prices (calculated over 10 minute intervals) in the E-mini S&P 500—59.75 points—occurred during the period 2:40 p.m. to 2:49 p.m. (Figure 29).

**Figure 29: CME E-mini S&P 500 Futures Trade Price and Volume**



Source: CME Group

According to the CME, over 250 Globex executing firms were active in routing E-mini S&P 500 futures contract orders into Globex during the hour beginning at 2 p.m.,

<sup>38</sup> Open interest means the total number of futures contracts that are not yet liquidated by offsetting transactions or cash settlement.

including the period from 2:40 p.m. to 3:00 p.m. A Globex executing firm is an entity that is directly connected into Globex. Non-Globex executing firms access that trading platform through a Globex executing firm.

Also during the hour of 2 p.m., Globex transactions in the E-mini S&P 500 futures were recorded for 6,939 buy accounts, 6,873 sell accounts, 7,669 buy user IDs, and 7,564 sell user IDs. A buy (sell) account is a unique Globex account that executed one or more buy (sell) orders. A buy (sell) user ID is a unique operator ID (also referred to as a "Tag 50 ID"), identifying the party who entered the order on behalf of the account. A Tag 50 ID may be authorized to enter orders on behalf of multiple accounts. As well, a single account may have multiple authorized Tag 50 IDs.

May 6, 2010 was also the first day in 2010 on which the Globex system activated the Stop Logic functionality in any equity index futures market.<sup>39</sup> Under CME rules, this functionality is initiated when the last transaction price would have triggered a series of stop loss orders that, if executed, would have resulted in a cascade in prices outside a predetermined 'no bust' range (6 points in either direction in the case of the E-mini S&P 500 futures contract). The purpose of this functionality is to prevent sudden, cascading declines (or increases) in price caused by order book imbalances.<sup>40</sup>

At 2:40 p.m. the E-mini S&P 500 was trading at 1,113. Five minutes later at 2:45 p.m. the E-mini S&P 500 had fallen another 57 points to 1,056. At 2:45:27 p.m., the E-mini S&P 500 dropped 12.75 points over a period of 500 milliseconds on the sale of 1,100 contracts by multiple market participants. This sequence of trades caused the market to trade down to an intraday low of 1,056. Further, at 2:45:27 p.m., the bid/ask spread in the E-mini S&P 500 market widened 6.5 points, or 26 ticks. This triggered the Globex 'Stop-Logic,' sending the E-mini S&P 500 into a reserve state at 2:45:28 p.m. The reserve state held execution of any transactions for five seconds. This hold allowed enough orders to flow into the market so that the next executed trade would be within six points of the last trade.<sup>41</sup> At 2:45:33 p.m. the E-mini S&P 500 exited its Stop-Logic reserve state.<sup>42</sup>

Stop Logic functionality was also triggered on May 6 in two currency futures contracts, the Japanese Yen and British Pound contracts. Across all CME Group equity index futures markets, the Stop Logic functionality was activated on seven occasions in 2009, on 18 occasions during 2008 (a year with greater market volatility due to the economic crisis), and on three occasions in 2007. Fourteen of these 29 activations in equity index futures, including the one on May 6, occurred in the E-mini S&P 500

<sup>39</sup> For more information on electronic trading, order display and order entry, see Appendix B.4, B.5 and B.8.

<sup>40</sup> For more information, see Appendix B.10 and B.11.

<sup>41</sup> If at the end of those five seconds there were no orders that would result in such a transaction, the market would have been held an additional five seconds.

<sup>42</sup> Upon exiting the reserve state, 1,753 contracts were traded at a price of 1056.75. The E-mini S&P 500 began to recover at that point.

contract. Save for the unusual circumstances of the Fall of 2008, Globex activates Stop Logic an average of five times per year across all equity index futures products, and an average of approximately three times per year in the E-mini contract. All Stop Logic functionality activations in CME equity index futures markets from 2007 through the present are listed in

Table 17.

Year	Date	Contract	Contract Name	Time (Central Time)	Total
2007	9/18/2007	ESU7	E MINI S&P 500	1:15 PM	1
	10/31/2007	EMDZ7	E-MINI MID CAP	1:14 PM	1
	12/24/2007	SPH8	BIG S&P 500	6:52 AM	1
<b>2007 Total</b>					<b>3</b>
2008	1/14/2008	ESH8	E MINI S&P 500	1:01 AM	1
	1/21/2008	SPH8	BIG S&P 500	2:12 AM	1
		ESH8	E MINI S&P 500	2:12 AM	1
	3/16/2008	ESH8	E MINI S&P 500	6:14 PM	1
				6:17 PM	1
				7:06 PM	1
	3/17/2008	ESH8	E MINI S&P 500	2:50 AM	1
	7/10/2008	NQU8	E MINI NASDAQ 100	11:01 PM	1
	9/14/2008	NQZ8	E MINI NASDAQ 100	5:00 PM	1
	9/16/2008	ESU8	E MINI S&P 500	1:14 PM	1
	9/25/2008	SPZ8	BIG S&P 500	10:45 PM	1
	10/6/2008	SPZ8	BIG S&P 500	3:30 PM	1
	10/9/2008	ESZ8	E MINI S&P 500	7:21 PM	1
	10/17/2008	ESZ8	E MINI S&P 500	3:01 AM	1
	10/29/2008	ESZ8	E MINI S&P 500	3:43 PM	1
	11/3/2008	SPZ8	BIG S&P 500	7:22 AM	1
	11/13/2008	ESH9	E MINI S&P 500	11:59 AM	1
	11/25/2008	SPZ8	BIG S&P 500	5:45 AM	1
<b>2008 Total</b>					<b>18</b>
2009	1/9/2009	SPH9	BIG S&P 500	7:30 AM	1
	2/27/2009	SPH9	BIG S&P 500	7:20 AM	1
	2/28/2009	ESZ9	E MINI S&P 500	10:32 AM	1
	3/6/2009	ZDH9	BIG DOW (\$10)	7:30 AM	1
	3/17/2009	NQM9	E MINI NASDAQ 100	1:17 PM	1

	4/23/2009	YMM9	E MINI DOW (\$5)	2:53 PM	1
	12/17/2009	NQH0	E MINI NASDAQ 100	8:57 AM	1
2009 Total					7
2010	5/6/2010	ESM0	E MINI S&P 500	1:45 PM	1
2010 Total					1
Total: 2007-2010					29

Source: CME Group

Although the triggering of the Stop Logic functionality in the E-mini S&P 500 futures contract is not unprecedented, the events of May 6 caused significant public concern about the functioning of financial markets. Previous Stop Logic events occurred, including during the financial crisis of 2008, when liquidity concerns played a key role. Consequently, CFTC staff has conducted an analysis of trading activity and liquidity provision in the June 2010 E-mini S&P 500 futures contract during 2:30 p.m. to 3:00 p.m. – the period of the day when trading volume and transaction prices were particularly volatile.

## 2. Role of Liquidity in Markets

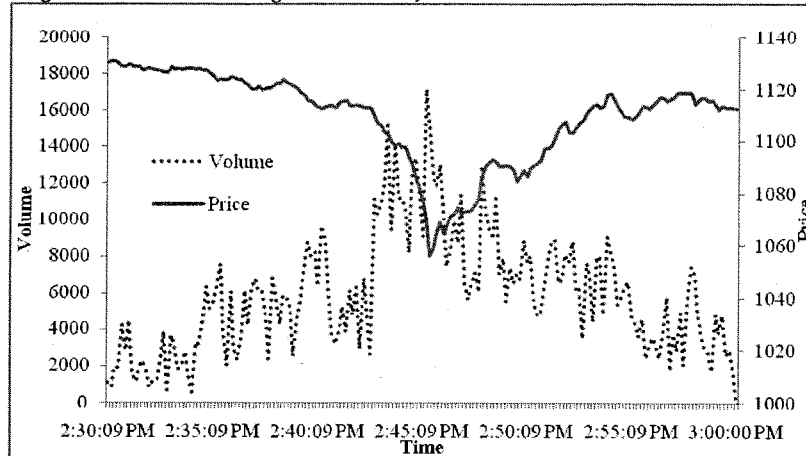
Liquidity reflects the ease with which certain amounts of an asset can be bought or sold without exerting a significant effect on its price. Higher market liquidity can be interpreted as a greater collective willingness to execute orders at given prices.

Market liquidity is not directly observable. In addition, market liquidity has multiple dimensions that are hard to capture by a single indicator. CFTC staff reviewed multiple indicators of liquidity, including, but not limited to, trading volume, bid/offer spread, and depth. High liquidity may manifest itself as high trading volume, narrow bid/offer spreads, and/or high depth of the order book at successive quotes.

As discussed below, preliminary analysis shows that between 2:30 p.m. and 3:00 p.m., trading volume spiked, bid/offer spreads widened, and depth declined. The latter two observations are consistent with a significant decline in liquidity with the bulk of that decline occurring between 2:42 p.m. and 2:45 p.m.

### a) Trading Volume

CFTC staff has analyzed trading volume and transaction prices for the June 2010 E-mini S&P 500 futures contract during the period 2:30 p.m. to 3:00 p.m. on May 6, 2010. Figure 30 presents transaction prices and trading volume for 10 second intervals from 2:30 p.m. to 3:00 p.m. for the June E-mini S&P 500 contract on May 6, 2010. According to Figure 1, between 2:30 p.m. and approximately 2:45 p.m., volume rose significantly while prices fell. Between 2:45 p.m. and 3:00 p.m. volume fell and prices rose.

**Figure 30: Price and Trading Volume in the June 2010 E-mini S&P 500 Futures Contract**

Source: CME Group

During the 30-minute period from 2:30 p.m. to 3:00 p.m., trading volume was about 10 times the average daily trading volume for the same intraday time period calculated over the prior 30 days. High trading volume by itself can be interpreted as an indicator of improved liquidity. However, Figure 30 shows that high trading volume was accompanied by significant volatility of trading volume. This suggests a dislocation of market liquidity, with high volume fluctuations at the same time that orders are executed deep into the limit order book. Consequently, liquidity indicators based on the characteristics of the limit order book may provide additional information about the liquidity dynamics during 2:30 p.m. to 3:00 p.m. on May 6, 2010.

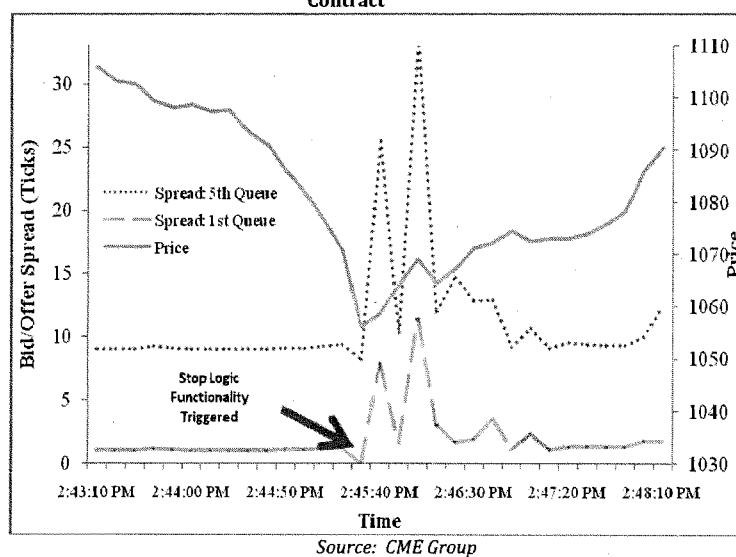
#### **b) Bid/Offer Spread**

The bid/offer spread is a liquidity indicator based on the characteristics of the limit order book. Specifically, the bid/offer spread is calculated as the difference between the highest quoted price to buy (bid) and the lowest quoted price to sell (offer or ask) one or several contracts or securities. This price difference is a measure of the cost paid by a buyer or a seller who wishes to transact immediately. Similarly, the second, third, fourth, fifth best bid and offer prices represent transaction costs to the buyer and seller willing to buy at increasingly lower prices and sell at increasingly higher prices.

Figure 31 presents the bid/offer spreads for the first best and fifth best quotes of the June 2010 E-mini S&P 500 specifically focusing on the period of 2:43 p.m. to 2:48 p.m. along with transaction prices. The spread is measured in ticks—minimum price increments; for the E-mini S&P 500 contract the tick is equal to 0.25 point. The smallest bid/offer spread is one tick (0.25 point) and the smallest spread between the fifth best

quotes is 9 ticks (2.25 points).<sup>43</sup> Until approximately 2:45 p.m., both spreads were at their minimums, as is most often observed in this market. At 2:45:28 p.m., the best bid/offer spread widened to 26 ticks (6.5 points). At this time, Globex Stop Logic triggered a 5-second reserve state in the E-mini S&P 500 contract. Following the reserve state, the first and fifth best quote spreads increased to the period maxima of approximately 11 ticks (2.85 points) and 33 ticks (8.25 points), respectively.<sup>44</sup> By 2:50:40 p.m., both spreads declined to about 1 and 9 ticks (0.25 and 2.25 points), respectively.

**Figure 31: Bid/Offer Spread (in Ticks) and Price in the June 2010 E-mini S&P 500 Futures Contract**



### c) Depth

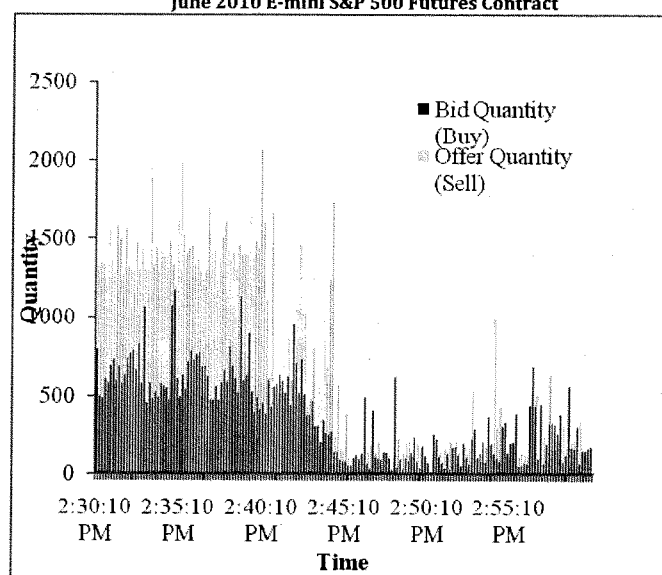
Depth is another liquidity indicator based on the size of orders in the limit order book. Depth is calculated as the sum of quantities of the orders resting at a particular price point—e.g., best bid or offer, second, third, fourth or fifth best bid or offer—in the limit order book. High depth (resting orders) on both sides of the limit order book may (but need not) result in higher trading volume (executed orders).

<sup>43</sup> Bid/offer spread between 2:30 p.m. and 2:43:10 p.m. and 2:48:10 p.m. and 3:00 p.m. are at their minimums.

<sup>44</sup> These spread measurements are graphed at 10 second intervals, with each data point representing the average of all quotes within a 1 second period.

Figure 32 illustrates the depth at the fifth best bid and offer quotes between 2:30 p.m. and 3:00 p.m. According to Figure 32, significant order imbalances existed between orders to buy and orders to sell. In addition, around 2:45 p.m., depth declined dramatically, but the limit order book became approximately balanced (orders to sell became approximately equal to orders to buy), which is its typical state.

**Figure 32: Bid/Offer Quantities: 5th Best in the June 2010 E-mini S&P 500 Futures Contract**



Source: CME Group

### 3. Analysis of Large Traders

In order to further analyze the liquidity dynamics between 2:30 p.m. and 3:00 p.m., CFTC staff examined the activities of large traders. In the preliminary analysis below, we report (1) the role of liquidity providers (six accounts, as defined below) and (2) activity of the ten largest traders by volume.

First, Figure 33 presents the total transaction sides<sup>45</sup> of two groups of market participants: liquidity providers and liquidity takers.

<sup>45</sup> A side of a transaction means the account was either the buyer or the seller in a transaction. Total volume is equal to half of all transaction sides. To convert transaction sides to volume for a group of accounts, one must also eliminate half of the sides of trades transacted within the group of accounts (that is, not with accounts outside of the group).

Liquidity providers are traders that are routinely present in the market to both buy and sell futures contracts, facilitating rapid execution of transactions. In electronic limit order markets such as Globex, where the E-mini S&P 500 futures contract is traded, there are no designated liquidity providers (that is, no trader has an obligation to provide bid and ask quotations on demand). Thus, for the purpose of this preliminary analysis, CFTC staff classified liquidity providers by their activity in the markets.<sup>46</sup>

CFTC staff classified six accounts as liquidity providers. These six accounts participated in about 50 percent of all transaction sides between 2:30 p.m. and 2:34 p.m. The remaining 4,573 accounts (of the total 4,579 accounts transacting between 2:30 p.m. and 3:00 p.m.) are defined as liquidity takers.

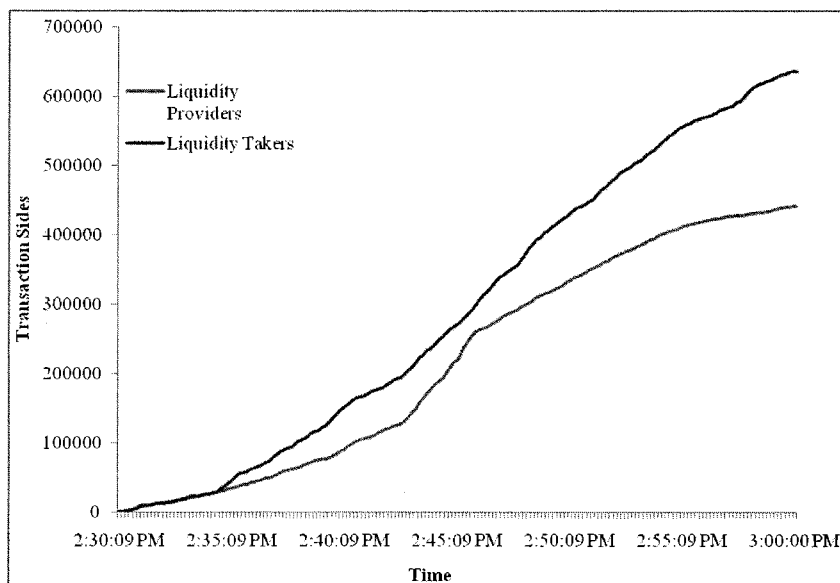
CFTC staff examined the behavior of liquidity providers during the time period 2:30 p.m. to 3:00 p.m. and observed that starting at approximately 2:35 p.m. liquidity providers began limiting their trading activity as measured by transaction sides in comparison to liquidity takers (Figure 33).<sup>47</sup> By 2:45:28 p.m., liquidity providers accounted for 46 percent of all transaction sides, lower than their participation percentage between 2:30 p.m. and 2:34 p.m. By 3:00 p.m. the liquidity providers accounted for 41 percent of transaction sides. The decline in the participation of liquidity providers in executed transactions can be interpreted as a partial withdrawal of liquidity by these six providers during a period of significant price movement.

<sup>46</sup> For the purposes of this analysis, liquidity providers are defined as follows: from the accounts that were both one of the 10 largest long gross volume accounts and 10 largest short gross volume accounts, CFTC staff selected the accounts that had a net position change of no more than 150 contracts (long or short) during the time period 2:30 p.m. to 2:45 p.m.

<sup>47</sup> CFTC staff confirmed that between 2:42 p.m. and 2:45 p.m. that several additional accounts (belonging to some of the most active traders) ceased trading. Furthermore, CFTC staff confirmed through trader interviews that several accounts belonging to some of the most active traders ceased trading within seconds after the Stop Logic functionality was triggered and did not return to the market until later. A trader may transact through multiple accounts in Globex.



**Figure 33: Cumulative Number of Transaction Sides of Liquidity Providers and Liquidity Takers in the June 2010 E-mini S&P 500 Futures Contract**



Source: CME Group and CFTC Staff Calculation

Second, CFTC staff reviewed the activity of the ten largest traders by net volume and by gross volume, in order to ascertain whether there were significant imbalances between large buyers and sellers in the market. For two intraday time periods—2:30 to 2:45 p.m. and 2:46 to 3:00 p.m.—the net volume was computed for each account in the E-mini S&P 500 June 2010 futures contract.<sup>48</sup> During the period from 2:30 to 2:45 p.m., the top 10 net buying accounts bought 51,526 contracts more than they sold. The top 10 net selling accounts sold 72,186 contracts more than they bought. During the period from 2:46 to 3:00 p.m., the top 10 net buying accounts bought 49,180 contracts more than they sold. The top 10 net selling accounts sold 67,544 contracts more than they bought.

In addition, CFTC staff identified the top ten most active accounts by gross volume between 2:00 p.m. and 3:00 p.m. Of those ten, nine trading accounts executed trades on both the long and short side of the market. For these trading accounts, there was a relative balance of activity between the long and short sides of the market.

<sup>48</sup> The numbers reported are the total net volume for accounts with the 10 largest net buy volumes (“top 10 net buying accounts”) and, separately, the total net volume for accounts with the 10 largest net sell volumes (“top 10 net selling accounts”). Net volume for an account was calculated as the total buy volume minus the total sell volume in the time period.

One out of the top ten trading accounts only entered orders to sell. That trader entered the market at around 2:32 p.m. and finished trading by around 2:51 p.m. The trader's short futures position represented on average, nine percent on the volume traded during that period. The trader sold on the way down and continued to do so even as the price level rose.

We are continuing to analyze trading activity, including conducting interviews with market participants to collect further data.

#### **4. Preliminary Findings**

The quantitative evidence presented above suggest that a confluence of economic events, market forces, and trading system functionality led to a significant dislocation of liquidity in the June 2010 E-mini S&P 500 futures contract sometime between 2:30 p.m. and 3:00 p.m. on May 6, 2010.

Prior to that time, a number of economic events and market developments led to a broad-based market desire to lessen risk exposures. This translated into a downward movement in prices across financial markets in conjunction with significant trading volume. At or about 2:30 p.m., the electronic limit order book in the E-mini S&P 500 futures market exhibited a significant imbalance of sell orders and buy orders. In the backdrop of declining prices, this imbalance appears to have contributed to a sudden liquidity dislocation despite increased trading volume. At approximately 2:45 p.m., several sell orders executed deep into the limit order book, which coincided with a significant loss of depth, triggering the Stop Logic functionality. The Stop Logic functionality in the E-mini S&P 500 contract has been triggered a number of times in the past few years, including several times during the financial crisis in the fall of 2008, when market conditions may have resembled those seen on May 6, 2010. Activation of the Stop Logic functionality on May 6, 2010, initiated a five second pause in trading in the E-mini S&P 500 futures contract. After the five second pause, the limit order book became more balanced, which is its typical state, and the price of the E-mini S&P 500 futures contract recovered.

### **C. Clearance and Settlement**

#### **1. Securities Markets**

Securities clearing agencies are self-regulatory organizations that are required to register with the SEC under Section 17A of the Securities Exchange Act. There are two types of securities clearing agencies – clearing corporations and depositories.

Clearing corporations compare member transactions (or report to members the results of exchange comparison operations), clear those trades and prepare instructions for automated settlement of those trades, and often act as intermediaries in making those settlements. Clearing corporations include the National Securities Clearing Corporation (“NSCC”), a subsidiary of the Depository Trust & Clearing Corporation (“DTCC”), and

the Options Clearing Corporation (“OCC”). Depositories hold securities in bulk form for their participants and maintain ownership records of the securities on their own books. Currently, the Depository Trust Company, a subsidiary of DTCC, is the primary U.S. securities depository.

There were no significant processing issues at DTCC or OCC as a result of the market events on Thursday, May 6. The clearing agencies’ systems operated in an orderly manner both during and subsequent to those market events.

Collection of funds due to the clearing agencies on the morning of Friday, May 7, occurred without incident as all clearing fund participants met their payment obligations on time.

To accommodate the late submission of trade data by exchanges, clearing agencies, where necessary, delayed end-of-day processing on Thursday, May 6. This was particularly the case at the DTCC subsidiary NSCC because of the large number of cancelled trades in the equities markets. Processing was completed at OCC only slightly later than usual.

The market volatility and price decreases on Thursday, May 6, also resulted in substantially higher margin and clearing fund requirements at the clearing agencies on Friday, May 7. The requirements were calculated pursuant to the risk-based margin methodologies in place at the clearing agencies and in accordance with clearing agency rules and procedures. All margin and clearing fund requirements were met by clearing participants Friday morning on time.

## **2. Futures Markets**

The Commodity Exchange Act (“CEA”) requires all CFTC regulated designated contract markets (“DCM”) to have all contracts that trade on the DCM to be cleared and settled by a CFTC registered derivatives clearing organization (“DCO”). The DCO functions as the central counterparty and guarantor for the positions that result from all contracts traded on the DCM. This means that the DCO is the long to each short position and the short to each long position in all contracts that it clears. DCOs deal exclusively with their clearing participants. Any market participant that is not a clearing member of a particular DCM must have its positions carried by a clearing member. The DCO for CME is the CME Clearing House while the DCO for ICE Futures US is ICE CLEAR US.

One of the critical functions that each CFTC registered DCO performs is the removal of debt obligations among its clearing members at least at the end of the trading session for a given trade date. This is accomplished by independently determining a settlement (or marking) price for each contract that is cleared and marking all open positions to that price. The DCO collects cash from clearing members that have lost money on their positions and pays it to clearing members that have gained money on their positions.

With respect to the trading that took place on May 6 at CME and ICE Futures U.S., the clearing and settlement processes worked effectively and without incident.

The amount that the CME collected and paid to its clearing members as a result of the end-of-day mark-to-market calculation for all contracts cleared by CME was \$4,073,195,863. Of this sum, \$2,902,837,844 was collected and paid in the customer origin while \$1,170,358,019 was collected and paid in the house origin.

The amount collected and paid by ICE CLEAR US to its clearing members as a result of the end-of-day mark-to-market calculation was \$749,680,556. Of this sum, \$120,701,044 was collected and paid in the customer origin while \$628,979,512 was collected and paid in the house origin.

All payments to and from each DCO were met on time.

## V. NEXT STEPS

### A. Areas for Further Analysis

#### 1. Securities Markets

A crucial area for further analysis is how sudden demands for liquidity (particularly by sellers in a rapidly declining market) are transmitted among the various securities, options, and futures markets and products. In today's highly automated and low-latency markets, the links between the various related markets and products are extremely tight.

To conduct this analysis, we are undertaking a detailed market reconstruction, so that cross-market patterns can be detected and the behavior of stocks or traders can be analyzed in detail. Reconstructing the market on May 6 from dozens of different sources and calibrating the time stamps from each source to ensure consistency across all the data is consuming a significant amount of SEC staff resources.<sup>49</sup> The data are voluminous, and include hundreds of millions of records comprising an estimated five to ten terabytes of information. On May 6, there were over 17 million trades between 2:00 p.m. and 3:00 p.m. alone. Overall, the markets processed 10.3 billion shares in NYSE stocks alone that day. By contrast, the key day in the 1987 Market Break Study involved a trading session processing a little over 600 million shares in NYSE stocks.

SEC staff is investigating plausible explanations of events, forming testable hypotheses and using the data available to us to assess them. There are many challenges to completing this analyses. The size and complexity of our markets and those of related markets, the effects of computerized trading, the diversity and opacity of trading strategies and linkages among financial instruments make this a complicated task.

A theory of the May 6 events should attempt to explain a number of the preliminary findings outlined in this report, to the extent they are confirmed by a more

<sup>49</sup> The SEC has obtained quotation and last-sale information produced by the Consolidated Tape plans, which cover all executions in NMS stocks, regardless of whether they occurred on an exchange or over-the-counter. The plans information also contains all top-of-book quotations (*i.e.*, the best orders or quotations in each listed equity security at each market at each point in time). However, the Consolidated Tape plans does not include orders that were outside the top of book, which constitute the vast majority of orders placed on any trading day. Most of these orders never execute and are canceled. Under current rules, there is no single record of such orders across the different markets. The relevant sources for this information include:

- OATS. The Order Audit Trail System (OATS) was established by NASD in 1996 and captures information on orders in Nasdaq-listed securities.
- OTS. The Order Tracking System (OTS) was established by the NYSE in 1999 and captures information on orders in equity securities listed on NYSE and NYSE Amex. The OTS is a system for gathering information by a request that can take ten days to fill.
- Individual exchanges. Each exchange has its own systems to record information about orders placed and executed on its market, regardless of which exchange lists the security.

exhaustive analysis, as well as any other facts uncovered. Among other things, a theory should explain:

- the sudden decline and sudden rebound in stocks generally;
- significant intraday negative returns of certain issues;
- the intraday lows of nearly zero in approximately 200 issues (shown in Figure 8), and the heightened levels of short selling that occurred at or near the intraday low;
- the extreme intraday highs of a significant number of issues, particularly among ETFs; and
- the disproportionate representation of ETFs among extreme returns.

A central component of this research is to understand the basic facts surrounding the event period and examine data from key additional sources. This exploratory work will guide the staff in forming causal hypotheses. For example, we will likely examine in more detail options data, including data on options transactions and quotes to better understand the role that participants in this market may have played.<sup>50</sup> We also will likely examine existing data on institutional and mutual fund holdings, as well as data from broker-dealers that will help attribute trades to specific brokerage accounts. In addition, we will examine trade and order characteristics to determine whether specific order types played a role in the breakdown of the price discovery mechanism.

Another key component of our analysis is to deepen our understanding of the behavior of groups of market participants. We, for example, will continue to examine the role of providers of liquidity, including market participants who have formal obligations under the federal securities laws or SRO rules. To the extent that data is available, we will seek to understand the impact of traders following high-frequency or algorithmic trading strategies. Many proprietary trading firms engage in automated strategies that continually monitor the various markets and products for disparities in prices. When the trading systems for these firms spot such disparities, they can generate in microseconds an enormous volume of orders that are intended to capitalize on these disparities. We would also consider examining the activities of ETF Authorized Participants in order to understand what, if any role, they played, in the markets of May 6. Additionally, our analysis to date has encompassed information about both ETF and non-ETF ETPs, but has not yet ascertained whether or not there are significant differences between the trading experiences of the two.

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<sup>50</sup> Our initial options analysis suggests that there were not triggers originating from the options markets.

## 2. Futures Markets

### a) Additional Analysis of Large Traders and Review of OTC Swaps

CFTC staff will continue reviewing information from a special call on over 40 large traders for their trading activity in the E-mini S&P 500 and Russell 2000 futures contracts on May 6, 2010. A special call is a CFTC directive to a trader holding a reportable position to furnish any pertinent information concerning the trader's positions, transactions, or activities.<sup>51</sup> A reportable position in the E-mini S&P 500 futures contract is 1,000 contracts.<sup>52</sup> Staff also will continue reviewing information from a special call to swap dealers about their activity in over-the-counter broad-based security index derivatives markets on May 6, 2010. Staff also will continue its detailed review of trader activity on May 6 through a comprehensive examination of trade-register data. To date, staff has received over 25 gigabytes of data in over 307,000 files, with more data expected.

### b) Additional Analysis of May 6 Activity

CFTC staff will continue to scrutinize a broad range of existing evidence, collect new evidence, and update its analysis of the events of May 6, 2010.

CFTC staff will also continue our analysis of high frequency traders active in the E-mini S&P 500 futures on May 6, 2010.

## 3. Coordinated Analysis

As reported above, related financial instruments appeared to experience significant volatility, including the sharp decline and recovery in close proximity. This suggests the need to study the linkages between correlated assets in the equities (single stocks, mutual funds and ETFs), options and futures markets. The study could partly focus on examining cross-market linkages by analyzing trading in stock index products such as equity index futures, ETFs, equity index options, and equity index OTC derivatives using, to the extent practicable, market data, special call information, and order book data. The growth, depth, and use of instruments in each of these markets to serve as intra- and cross-market hedges suggest that regulators need to better understand the linkages between these markets.

Given the role that the two agencies play in overseeing key related markets, the staff of the CFTC and SEC should coordinate on a study designed to shed further light on these linkages. Such a study may significantly help design a coordinated system of meaningful and appropriate pauses and halts for these interlinked markets.

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<sup>51</sup> 17 CFR 18.05.

<sup>52</sup> 17 CFR 15.03.

## **B. Potential Regulatory Responses**

The Commissions are considering whether modifications to the existing market-wide circuit breakers are warranted in light of the events of May 6. Any such modifications should be done in a coordinated manner between the securities and futures markets.

An important lesson from the events of May 6 is the need to better understand cross-market linkages between trading venues for exchange-traded funds, equity index futures, and equity index options—instruments used by investors to manage their exposures in the face of broad market movements. A thorough understanding of cross-market linkages will better inform the design of a coordinated system of meaningful and appropriate pauses and halts for these interlinked markets.

In connection with better understanding inter-market mechanisms, it is also important for the agencies to review the various mechanisms used and designed by exchanges to protect orderly markets. As the study of the May 6 events continues, attention should be given to the adequacy of current mechanisms under different stress situations.

### **1. Securities Markets**

As noted above, the SEC is taking a number of steps to identify the cause or causes of the May 6 market disruption as well as factors that may have exacerbated that event, and to develop regulatory initiatives to help prevent a recurrence.

#### **a) Implement Stock-by-Stock Circuit Breakers**

The SEC staff is working with the stock exchanges and FINRA to promptly develop and implement a cross-market “circuit breaker” mechanism to be applied on a stock-by-stock basis. Although the prices of many stocks on May 6 declined in proportion with the broader market decline that occurred in securities and futures index products, the prices of many other individual stocks declined much more before returning near to the prices at which they were trading prior to the precipitous decline.

A uniform circuit breaker rule, which would briefly pause trading across the securities markets when the price of a security has rapidly declined over a short period of time, should make a recurrence of a severe market disruption, such as the one that occurred on May 6, much less likely.

#### **b) Market Orders**

As noted above, some of the most disturbing executions on May 6 likely resulted from the use of market orders. Market orders – particularly stop loss orders that convert



to market orders – are popular with certain investors, including retail investors, and it is possible such investors may have been on the losing side of a number of these trades.

We are considering ways to address the risks of market orders, and their potential to contribute to sudden price moves. Areas under consideration include: (1) requiring market order “collars,” thereby effectively converting market orders into limit orders; (2) prohibiting or limiting the use of market orders; (3) requiring broker-dealers to specifically warn retail customers about the risks of market orders, particularly in volatile markets; and (4) pursuing investor education initiatives as to the risks of market orders.

#### **c) Market Making Obligations and Stub Quotes**

Liquidity providers to, or “the other side” of, the extraordinarily erroneous trades seen on May 6 appears in many cases to be “stub” quotes (*e.g.*, a \$0.01 bid) of market makers that effectively had pulled out of the market. Market makers maintain these nominal quotes to meet exchange requirements that they maintain a two-sided quote throughout the trading day. We are considering steps to deter or prohibit stub quotes, including: (1) requiring all market makers to maintain bona fide quotes that are reasonably related to the market, perhaps using objective parameters that are consistent across markets; or (2) alternatively, relaxing requirements that market makers maintain a two-sided quote throughout the day, and thereby obviate the need for market makers to post stub quotes that could be executed against in severe market conditions.

#### **d) Revise Procedures for Breaking Clearly Erroneous Trades**

The SEC expects the exchanges and FINRA to improve the process for breaking “clearly erroneous” trades. Of course, the primary objective should be a market structure that minimizes the need to correct erroneous trades, and the initiatives described above should do that. To the extent any erroneous trades continue to occur, however, they should be resolved promptly and consistently across markets through a transparent process with objective standards. The SROs are considering a specified percentage threshold away from the market price at which erroneous trades uniformly would be broken. This should provide market participants clarity and certainty as to whether their trades will stand in the event the market becomes particularly volatile.

#### **e) Current Initiatives to Strengthen Market Integrity**

The SEC had already undertaken a number of broader initiatives to strengthen the integrity of our markets, even before the events of May 6.

In January, the SEC published a concept release on equity market structure (“Market Structure Concept Release”)<sup>53</sup> that highlighted many aspects of today’s highly automated markets and requested public comment on a wide variety of issues. The

<sup>53</sup> See Securities Exchange Act Release No. 61358 (January 14, 2010), 75 FR 3594 (January 21, 2010).

Market Structure Concept Release was designed to further the SEC's broad review of market structure to assess whether its rules have kept pace with, among other things, changes in trading technology and practices.

The events of May 6 implicate a number of issues raised in the Market Structure Concept Release. For example, the Release asked whether the current market structure appropriately minimizes the short-term volatility that can be harmful to long-term investors. It asked whether the relatively good performance of the market structure in 2008 indicated that systemic risk was appropriately minimized in the current market structure and, if not, what further steps the SEC should take to address systemic risk. Finally, it noted the dominant role of high-frequency trading firms in today's market structure and observed that they had largely replaced the role of specialists and market makers with affirmative and negative obligations for market liquidity and market quality. More specifically, the Market Structure Concept Release asked whether there is any evidence that proprietary firms increase or reduce the amount of liquidity provided to the market during times of stress. It also asked whether co-location conveyed any unfair advantage and discussed various types of short-term trading strategies, including "directional" strategies, such as "momentum ignition," that could present serious problems in today's market structure by exacerbating short-term volatility.

We are also considering whether initiatives are warranted to address destabilizing short-term trading strategies, to the extent they contributed to the May 6 market disruption. For example, a variety of directional strategies that might be employed by proprietary trading firms are discussed in the Market Structure Concept Release. It is too early to know whether short-term professional trading strategies played any role in the events of May 6. If they contributed significantly to the precipitous decline, however, we must consider whether additional regulatory requirements are necessary to prevent such strategies from threatening the fairness and integrity of the markets.

In February, moreover, the SEC adopted a short sale circuit breaker. That rule is designed to limit short selling where an individual stock is under stress and has experienced a decline of 10 percent from the previous day's close. At that point, the restrictions of the rule provide assurances to investors that short sellers are not taking the stock down. In so doing, we believe that the rule will promote investor confidence.

In addition, the SEC has published a series of concrete market structure proposals that are designed to strengthen the U.S. securities markets and to protect investors. These include the proposal to prohibit flash orders and the proposal to increase the transparency of "dark" pools of liquidity, as well as the market access proposal to strengthen broker-dealer risk management controls and the large trader reporting proposal to enhance the SEC's surveillance and enforcement capabilities. These proposals are described in greater detail below.

### **(1) Market Access Proposal**

In January, the SEC proposed a rule that would require effective risk management controls for broker-dealers with access to markets, including those providing customers sponsored access to the markets. Our proposal would effectively prohibit the growing practice by some broker-dealers of providing “unfiltered” sponsored access, where a customer is permitted to directly access the markets using the broker-dealer’s market participant identifier but without the imposition of effective pre-trade risk management controls. All broker-dealers accessing the markets should implement controls to effectively manage the risks associated with this activity, and our proposal would unequivocally require them to do so. These risks include the potential breach of a credit or capital limit, the submission of erroneous orders as a result of computer malfunction or human error, and the failure to comply with regulatory requirements. Effective risk management controls for market access arrangements are necessary to protect the broker-dealer, the markets, the financial system, and ultimately investors. Such controls would help prevent trading activity that could trigger a severe market disruption.

### **(2) Large Trader Reporting Proposal**

Last month, the SEC proposed to create a large trader reporting system that would enhance our ability to identify large market participants, collect information on their trades, and analyze their trading activity. To keep pace with rapid technological advances that have impacted trading strategies and the ways in which some market participants trade, the SEC must be able to readily identify large traders operating in the U.S. securities markets, and obtain basic identifying information on each large trader, its accounts, and its affiliates. In addition, to support its regulatory and enforcement activities, the SEC must have a mechanism to track efficiently and obtain promptly trading records on large trader activity.

The current system for collecting transaction data from registered broker-dealers is generally utilized in more narrowly-focused investigations involving trading in particular securities, and is not generally conducive to larger-scale market reconstructions and analyses involving numerous stocks during periods of peak trading volume. In addition, existing tools often require weeks or longer to compile trading data to identify potentially large traders. The SEC needs to develop the tools necessary to readily identify large traders and be able to evaluate their trading activity is heightened by the fact that large traders, including certain high-frequency traders, are playing an increasingly prominent role in the securities markets.

The proposed rule would enhance the SEC’s ability to identify those “large trader” market participants that conduct a substantial amount of trading activity in U.S. securities, as measured by volume or market value. In addition, the proposal would facilitate the SEC’s ability to obtain from broker-dealers records of large trader activity. By providing the SEC with prompt access to information about large traders and their trading activity, the proposed rule is intended to facilitate the SEC’s efforts in

reconstructing market activity and performing analyses of trading data, as well as assist in investigations of manipulative, abusive, and other illegal trading activity.

### **(3) Consideration of Consolidated Audit Trail Proposal**

As noted above, SEC staff have been working, in consultation with SROs and others, on a rule proposal that would require the SROs to jointly develop, implement and maintain a consolidated order tracking system, or consolidated audit trail. If adopted, this rule proposal should result in a continuous reporting mechanism for market participants that would capture the data needed for effective cross-market surveillance. The proposed changes would significantly improve the SEC's ability to conduct timely and accurate trading analyses for market reconstructions and complex investigations, as well as inspections and examinations. For example, the proposed consolidated audit trail would enable the SEC to access in real time the majority of the data needed to reconstruct the type of market disruption that occurred on May 6, with remaining information available within a matter of days rather than weeks.

## **2. Futures Markets**

### **a) Review of Electronic Trading and Market Access**

CFTC staff will also continue our analysis, already begun by our Office of Chief Economist, of liquidity provision in futures markets, with a particular focus on electronic trading. The subjects to be reviewed here include high frequency and algorithmic trading, automatic execution innovations on trading platforms, market access issues, and co-location.

### **b) Review of Co-Location**

CFTC staff is considering a proposed rulemaking with respect to exchange co-location and proximity hosting services. The purpose of the proposed rule would be to ensure that all otherwise qualified and eligible market participants that seek co-location or proximity hosting services offered by futures exchanges have equal access to such services without barriers that exclude access, or that bar otherwise qualified third-party vendors from providing co-location and/or proximity hosting services. Another purpose of the proposal would be to ensure that futures exchanges that offer co-location or proximity hosting services disclose publically the latencies for each available connectivity option, so that participants can make informed decisions.

### **c) Additional Analysis of Large Traders and Review of OTC Swaps**

The CFTC will continue reviewing information from a special call on major swap traders for their trading activity on May 6, 2010. A special call is a CFTC directive to a trader holding a reportable position to furnish any pertinent information concerning the

trader's positions, transactions, or activities.<sup>54</sup> A reportable position in the E-mini S&P 500 futures contract is 1,000 contracts.<sup>55</sup> There will also be a review of special call information about the activity of swap dealers in over-the-counter broad-based security index derivatives markets on May 6, 2010. Staff also will continue its detailed review of trader activity on May 6 through a comprehensive examination of trade-register data.

**d) Automation of Account Identification**

CFTC staff will also be considering possible rules to enhance the CFTC's surveillance capabilities. These measures include automation of the statement of reporting traders in the large trader reporting system and obtaining account ownership and control information in the exchange trade registers.<sup>56</sup> These initiatives would increase the timeliness and efficiency of account identification, an essential step in data analysis.

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<sup>54</sup> 17 CFR 18.05.

<sup>55</sup> 17 CFR 15.03.

<sup>56</sup> 17 CFR 18.04.

## APPENDIX A

### Overview of the Securities Market Structure

#### A. The National Market System and Regulation NMS

In Section 11A of the Securities Exchange Act of 1934 (added to the Exchange Act in 1975), Congress directed the SEC to facilitate the establishment of a national market system for securities in accordance with specified findings and objectives. Congress recognized that the securities markets are an important national asset that must be preserved and strengthened, and that new data processing and communications techniques create the opportunity for more efficient and effective market operations. It mandated a national market system composed of multiple competing markets that are linked through technology. A national market system should be contrasted with a structure in which trading is confined to a single trading venue, such as one particular exchange. Congress determined that promoting competition among trading venues and giving as many market makers as possible an opportunity to provide liquidity in stocks would promote greater liquidity and price continuity than a single dominant trading venue.

Over the years, the SEC has sought to keep market structure rules up-to-date with continually changing economic conditions and technology advances. The most recent major updating of the national market system rules occurred in 2005, when the SEC adopted Regulation NMS.<sup>57</sup> Regulation NMS addresses four areas: (1) a “trade-through” rule that prevents the execution of trades at prices that are inferior to a displayed and immediately accessible quotation on another trading venue; (2) an “access” rule that, among other things, promotes private linkages among market participants and trading venues; (3) a “sub-penny” rule that prohibits the display, ranking, or accepting of orders with sub-penny prices; and (4) amendments to the joint-industry plans for collecting and distributing consolidated market data to the public.

The trade-through rule<sup>58</sup> is probably the most well-known aspect of Regulation NMS and arguably has affected the equities markets most significantly since it was adopted in 2005. The Regulation NMS trade-through rule eliminated a prior rule that benefited dominant exchanges with trading floors by protecting their manual quotations (that is, orders were required to be routed to the exchange in an attempt to access a manual quotation that could take as long as 10-20 seconds, rather than to another venue with an immediately accessible quotation at an inferior price).

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<sup>57</sup> See Securities Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37496 (June 29, 2005) (“Regulation NMS Release”).

<sup>58</sup> 17 CFR 242.611.

To compete under the new regulatory structure, all exchanges developed electronic systems that are capable of providing immediate responses to incoming orders and updating their quotations immediately. These systems enable the exchanges to display quotations that are protected against trade-throughs. Trade-through protection was designed to promote best execution and price stability by preventing one trading venue from ignoring the immediately accessible quotations of another trading venue in a downturn (as well as upturn). However, the trade-through rule does not protect a trading venue's quotation if it is not immediately accessible.

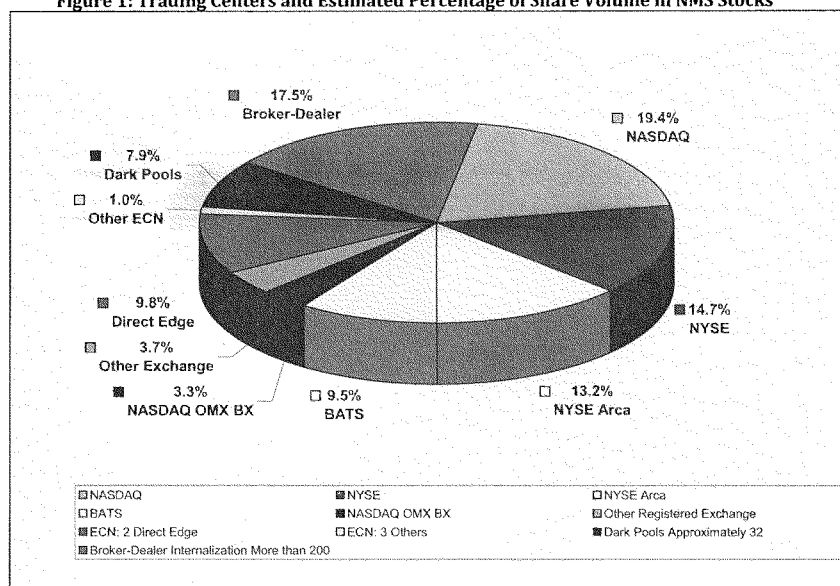
## **B. The Nature of Trading in the Current Equities Market Structure**

### **1. Trading Centers**

At least partly as a result of Regulation NMS, trading in U.S.-listed stocks has changed dramatically in recent years. Trading volume now is dispersed among many different trading venues. For example, the share of the New York Stock Exchange in the trading in NYSE-listed stocks declined from 79.1 percent in 2005 to 25.1 percent in 2009. National securities exchanges and another type of trading venue, electronic communications networks ("ECNs"), both display quotations in the consolidated quotation data that is widely distributed to the public. In addition, two other types of trading centers exist –dark pools and broker-dealers that execute trades internally – neither of which display quotations in the consolidated quotation data. Nevertheless, more than 70 percent of volume continues to be executed by public trading venues that display quotations across a wide range of U.S.-listed stocks. Figure 1 below sets forth the major types of trading venues, along with estimates of their trading volume in September 2009:<sup>59</sup>

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<sup>59</sup> Sources of estimated trading volume percentages: NASDAQ; NYSE Group; BATS; Direct Edge; data compiled from Forms ATS for 3d quarter 2009.

**Figure 1: Trading Centers and Estimated Percentage of Share Volume in NMS Stocks****a) Registered Exchanges**

Registered exchanges (such as NASDAQ, NYSE, NYSE Arca and BATS, among others) must undertake self-regulatory responsibility for their members and file their proposed rule changes for approval with the SEC. These proposed rule changes publicly disclose, among other things, the trading services and fees of exchanges.

The registered exchanges all have adopted highly automated trading systems that can offer extremely high-speed, or “low-latency,” order responses and executions. The average response times at some exchanges, for example, have been reduced to less than 1 millisecond.<sup>60</sup> Many exchanges also offer individual data feeds that deliver information concerning their orders and trades directly to customers. To further increase speed in transmitting market data and order messages, many exchanges also offer co-location services that enable exchange customers to place their servers in close proximity to the exchange’s matching engine.

Registered exchanges typically offer a wide range of order types for trading on their automated systems. Some of their order types are displayable in full if they are not

<sup>60</sup> See, e.g., BATS Exchange, Inc., [http://batstrading.com/resources/features/bats\\_exchange\\_Latency.pdf](http://batstrading.com/resources/features/bats_exchange_Latency.pdf) (June 2009) (average latency (time to accept, process, and acknowledge or fill order) of 320 microseconds; NASDAQ, <http://www.nasdaqtrader.com/trader.aspx?id=inet> (December 12, 2009) (average latency (time to accept, process, and acknowledge or fill order) of 294 microseconds).



executed immediately. Others are undisplaced, in full or in part. For example, a reserve order type will display part of the size of an order at a particular price, while holding the balance of the order in reserve and refreshing the displayed size as needed. In general, displayed orders are given execution priority at any given price over fully undisplaced orders and the undisplaced size of reserve orders.<sup>61</sup>

In addition, many exchanges have adopted a “maker-taker” pricing model in an effort to attract liquidity providers. Under this model, non-marketable, resting orders that offer (make) liquidity at a particular price receive a liquidity rebate if they are executed, while incoming orders that execute against (take) the liquidity of resting orders are charged an access fee. Rule 610(c) of Regulation NMS caps the amount of the access fee for executions against the best displayed prices of an exchange at 0.3 cents per share. Exchanges typically charge a somewhat higher access fee than the amount of their liquidity rebates, and retain the difference as compensation. Sometimes, however, exchanges have offered “inverted” pricing and pay a liquidity rebate that exceeds the access fee.

#### **b) ECNs**

ECNs, as well as dark pools (discussed below) are regulated as alternative trading systems (“ATSS”). The key characteristic of an ECN is that it provides its best-priced orders for inclusion in the consolidated quotation data, whether voluntarily or as required by Rule 301(b)(3) of Regulation ATS. In general, ECNs offer trading services (such as displayed and undisplaced order types, maker-taker pricing, and data feeds) that are analogous to those of registered exchanges.

#### **c) Dark Pools**

Dark pools are ATSS that, in contrast to ECNs, do not provide their best-priced orders for inclusion in the consolidated quotation data. In general, dark pools offer trading services to institutional investors and others that seek to execute large trading interest in a manner that will minimize the movement of prices against the trading interest and thereby reduce trading costs. There are approximately 32 dark pools that actively trade NMS stocks.<sup>62</sup> ATSS (both dark pools and ECNs) fall within the statutory definition of an exchange, but are exempted if they comply with Regulation ATS.

<sup>61</sup> See, e.g., BATS Exchange, Inc., Rule 11.12 (equally priced trading interest executed in time priority in the following order: (1) displayed size of limit orders; (2) non-displayed limit orders; (3) pegged orders; (4) mid-point peg orders; (5) reserve size of orders; and (6) discretionary portion of discretionary orders); NASDAQ Rule 4757(a)(1) (book processing algorithm executes trading interest in the following order: (1) displayed orders; (2) non-displayed orders and the reserve portion of quotes and reserve orders (in price/time priority among such interest); and (3) the discretionary portion of discretionary orders).

<sup>62</sup> Data compiled from Forms ATS submitted to Commission for 3d quarter 2009. Some OTC market makers offer dark liquidity primarily in a principal capacity and do not operate as ATSS. For purposes of this report, such trading centers are not defined as dark pools because they are not ATSS. They may, however, offer electronic dark liquidity services that are analogous to those offered by dark pools.

Regulation ATS requires ATSs to be registered as broker-dealers with the SEC, which entails becoming a member of the Financial Industry Regulatory Authority (“FINRA”) and fully complying with the broker-dealer regulatory regime. Unlike a registered exchange, an ATS is not required to file proposed rule changes with the SEC or otherwise publicly disclose its trading services and fees. ATSs also do not have any self-regulatory responsibilities, such as market surveillance.

Dark pools can vary quite widely in the services they offer their customers. For example, some dark pools, such as block crossing networks, offer specialized size discovery mechanisms that attempt to bring large buyers and sellers in the same NMS stock together anonymously and to facilitate a trade between them. The average trade size of these block crossing networks can be as high as 50,000 shares.<sup>63</sup> Most dark pools, though they may handle large orders, primarily execute trades with small sizes that are more comparable to the average size of trades in the public markets, which was less than 300 shares in July 2009.<sup>64</sup> These dark pools that primarily match smaller orders (though the matched orders may be “child” orders of much larger “parent” orders) execute more than 90% of dark pool trading volume.<sup>65</sup> The majority of this volume is executed by dark pools that are sponsored by multi-service broker-dealers. These broker-dealers also offer order routing services, trade as principal in the sponsored ATS, or both.

#### **d) Broker-Dealer Internalization**

The other type of undisplayed trading center is a non-ATS broker-dealer that internally executes trades, whether as agent or principal. Notably, many broker-dealers may submit orders to exchanges or ECNs, which then are included in the consolidated quotation data. The internalized executions of broker-dealers, however, primarily reflect liquidity that is not included in the consolidated quotation data. There are a large number of broker-dealers that execute trades internally in NMS stocks.<sup>66</sup>

Broker-dealers that internalize executions generally fall into two categories – OTC market makers<sup>67</sup> and block positioners.<sup>68</sup> Broker-dealers that act as OTC market

<sup>63</sup> See, e.g., <http://www.liquidnet.com/about/liquidStats.html> (average U.S. execution size in July 2009 was 49,638 shares for manually negotiated trades via Liquidnet’s negotiation product); <http://www.pipeline trading.com/AboutPipeline/CompanyInfo.aspx> (average trade size of 50,000 shares in Pipeline).

<sup>64</sup> See, e.g., <http://www.nasdaqtrader.com/trader.aspx?id=marketshare> (average size of NASDAQ matched trades in July 2009 was 228 shares); <http://nyxdata.com/nysedata/asp/factbook> (NYSE Group average trade size in all stocks traded in July 2009 was 267 shares).

<sup>65</sup> Data compiled from Forms ATS submitted to Commission for 3d quarter 2009.

<sup>66</sup> For example, more than 200 publish execution quality statistics under Rule 605 of Regulation NMS.

<sup>67</sup> An OTC market maker is defined in Rule 600(b)(52) of Regulation NMS as “any dealer that holds itself out as being willing to buy and sell to its customers, or others, in the United States, an NMS stock for its own account on a regular or continuous basis otherwise than on a national securities exchange in amounts of less than block size.”

makers and block positioners conduct their business primarily by directly negotiating with customers or with other broker-dealers representing customer orders. OTC market makers, for example, appear to handle a very large percentage of marketable (immediately executable) order flow of individual investors that is routed by retail brokerage firms.<sup>69</sup>

#### e) Market Linkages

In adopting Regulations NMS, the SEC also included an “access” rule that, among other things, promotes private linkages among market participants and trading venues. In contrast to some markets where trading is concentrated on a single exchange or market, because liquidity on the equity markets is dispersed across a large number of trading centers of different types, linking the various trading venues is critical to the successful operation of the national market system.

Rule 611 of Regulation NMS provides protection against trade-throughs.<sup>70</sup> A trade-through is the execution of a trade at a price inferior to a protected quotation for an NMS stock. A protected quotation must be displayed by an automated trading center, must be disseminated in the consolidated quotation data, and must be an automated quotation that is the best bid or best offer of a national securities exchange or FINRA.<sup>71</sup> Importantly, Rule 611 applies to all trading centers, not just those that display protected quotations. Trading center is defined broadly in Rule 600(b)(78) to include, among others, all exchanges, all ATSS (including ECNs and dark pools), all OTC market makers, and any other broker-dealer that executes orders internally, whether as agent or principal. In practice, the national best bid and national best offer (“NBBO”)<sup>72</sup> is the best bid and best offer from among the protected quotations, *i.e.*, the best bid and best offer of all the stock exchanges and FINRA’s ADF.<sup>73</sup>

<sup>68</sup> “Block size” is defined in Rule 600(b)(9) of Regulation NMS as an order of at least 10,000 shares or for a quantity of stock having a market value of at least \$200,000. A block positioner generally means any broker-dealer in the business of executing, as principal or agent, block size trades for its customers. To facilitate trades, block positioners often commit their own capital to trade as principal with at least some part of the customer’s block order.

<sup>69</sup> For example, a 2<sup>nd</sup> quarter of 2009 review of the order routing disclosures required by Rule 606 of Regulation NMS of eight broker-dealers with significant retail customer accounts reveals that nearly 100% of their customer market orders are routed to OTC market makers. The review also indicates that most of these retail brokers either receive payment for order flow in connection with the routing of orders or are affiliated with an OTC market maker that executes the orders.

<sup>70</sup> Rule 611(a)(1) requires all trading centers to establish, maintain, and enforce written policies and procedures that are reasonably designed to prevent trade-throughs of protected quotations, subject to certain exceptions set forth in Rule 611(b).

<sup>71</sup> FINRA operates the Alternative Display Facility (“ADF”), a display-only facility that permits its participants to display quotations and report trades, among other things.

<sup>72</sup> 17 CFR 242.600(b)(42).

<sup>73</sup> Technically, the NBBO may include the best bid and best offer of a stock exchange or the ADF even if is non-automated (*i.e.*, manual). In practice, however, all such markets are fully automated with the exception of NYSE (and NYSE Amex, which operates on the same system as NYSE) for

Protection against trade-throughs is an important linkage among trading centers because it provides a baseline assurance that: (1) marketable orders will receive at least the best displayed price, regardless of the particular trading center that executes the order or where the best price is displayed in the national market system; and (2) quotations that are displayed at one trading center will not be bypassed by trades with inferior prices at any trading center in the national market system.

Rule 611 also helps promote linkages among trading centers by encouraging them, when it does not have available trading interest at the best price, to route marketable orders to a trading center that is displaying the best price. Although Rule 611 does not directly require such routing services (a trading center can, for example, cancel and return an order when it does not have the best price), competitive factors have led many trading centers to offer routing services to their customers. With Regulation NMS, the SEC adopted a “private linkages” approach that relies exclusively on brokers to provide routing services, both among exchanges and between customers and exchanges.<sup>74</sup> Under this approach, market participants obtain access to the various trading centers through broker-dealers that are members or subscribers of the particular trading center.<sup>75</sup> Rule 610(a) of Regulation NMS, for example, prohibits an SRO trading facility from imposing unfairly discriminatory terms that would prevent or inhibit any person from obtaining efficient access through an SRO member to the displayed quotations of the SRO trading facility.<sup>76</sup>

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which, when it hits a liquidity replenishment point for a given security, its quotation becomes non-firm and thus is not included in the calculation of the NBBO.

<sup>74</sup> Prior to Rule 611, exchanges routed orders through an inflexible, partially manual system called the Intermarket Trading System (“ITS”). See Regulation NMS Release, 70 FR at 37538-37539 (“Although ITS promotes access among participants that is uniform and free, it also is often slow and limited.”).

<sup>75</sup> See Regulation NMS Release, 70 FR at 37540 (“[M]any different private firms have entered the business of linking with a wide range of trading centers and then offering their customers access to those trading centers through the private firms’ linkages. Competitive forces determine the types and costs of these private linkages.”).

<sup>76</sup> In addition, Rule 610(c) limits the fees that a trading center can charge for access to its displayed quotations at the best prices. Rule 611(d) requires SROs to establish, maintain, and enforce rules that restrict their members from displaying quotations that lock or cross previously displayed quotations.

Section 6(a)(2) of the Exchange Act requires registered exchanges to allow any qualified and registered broker-dealer to become a member of the exchange – a key element in assuring fair access to exchange services. In contrast, the access requirements that apply to ATSs are much more limited. Regulation ATS includes two distinct types of access requirements: (1) order display and execution access in Rule 301(b)(3); and (2) fair access to ATS services in general in Rule 301(b)(5). An ATS must meet order display and execution access requirements if it displays orders to more than one person in the ATS and exceeds a 5% trading volume threshold. An ATS must meet the general fair access requirement if it exceeds a 5% trading volume threshold. If an ATS neither displays orders to more than one person in the ATS nor exceeds a 5% trading volume threshold, Regulation ATS does not impose access requirements on the ATS.

In a dispersed and complex market structure with many different trading centers offering a wide spectrum of services, brokers play a significant role in linking trading centers together into a unified national market system. Brokers compete to offer the sophisticated technology tools that are needed to monitor liquidity at many different venues and to implement order routing strategies. To perform this function, brokers may monitor the execution of orders at both displayed and undisplayed trading centers to assess the availability of undisplayed trading interest. Brokers may, for example, construct real-time “heat maps” in an effort to discern and access both displayed and undisplayed liquidity at trading centers throughout the national market system.

Using their knowledge of available liquidity, many brokers offer smart order routing technology to access such liquidity. Many brokers also offer sophisticated algorithms that will take the large orders of institutional investors and others, divide a large “parent” order into many smaller “child” orders, and route the child orders over time to different trading centers in accordance with the particular trading strategy chosen by the customer. Such algorithms may be “aggressive,” for example, and seek to take liquidity quickly at many different trading centers, or they may be “passive,” and submit resting orders at one or more trading centers and await executions at favorable prices. To the extent they help customers cope with the dispersal of liquidity among a large number of trading centers of different types and achieve the best execution of their customers’ orders, the routing services of brokers can contribute to the broader policy goal of promoting efficient markets.

The linkage function of brokers also is supported by a broker’s legal duty of best execution. This duty requires a broker to obtain the most favorable terms reasonably available when executing a customer order.<sup>77</sup> Of course, this legal duty is not the only pressure on brokers to obtain best execution. The existence of strong competitive pressure to attract and retain customers encourages brokers to provide high quality routing services to their customers.<sup>78</sup>

#### **f) Professional Liquidity Providers on Exchanges and ECNs**

Liquidity on equities exchanges and ECNs is derived from orders to buy or sell securities as well as quotations submitted by members of an exchange that are registered as market makers. Professional liquidity providers are proprietary traders in the business of providing liquidity to the market, often through the submission of limit orders that rest on the electronic order books of exchanges and ECNs.<sup>79</sup> They include registered entities,

<sup>77</sup> See, e.g., Regulation NMS Release, 70 FR at 37537-37538 (discussion of duty of best execution).

<sup>78</sup> In this regard, Rules 605 and 606 of Regulation NMS are designed to support competition by enhancing the transparency of order execution and routing practices. Rule 605 requires market centers to publish monthly reports of statistics on their order execution quality. Rule 606 requires brokers to publish quarterly reports on their routing practices, including the venues to which they route orders for execution.

<sup>79</sup> As noted above, over-the-counter market makers also provide liquidity by trading chiefly with customer orders.

such as exchange specialists and market makers, as well as unregistered proprietary trading firms that engage in passive market making and other types of trading strategies. As discussed below, some types of professional liquidity providers have certain obligations, such as to provide liquidity whether the market is up or down and maintain fair and orderly markets. Other professional liquidity providers do not have such responsibilities, including some of the high frequency proprietary trading firms that also are discussed below.

### (1) Market Makers

In general, the rules of national securities exchanges allow a member, on a voluntary basis, to register as a market maker on a security-by-security basis and subject to certain obligations. While the rules of a national securities exchange may contain provisions that provide for market makers, these rules do not require any member to register as a market maker.<sup>80</sup> Accordingly, an exchange may not have registered market makers even though its rulebook provides for them. In addition, the rules of many exchanges permit multiple members to register as market makers for the same security.

Pursuant to exchange rules, registered market makers are required to engage in a course of dealings for their own account to assist in the maintenance, insofar as reasonably practicable, of fair and orderly markets. These exchange rules generally require a market maker to maintain a continuous two-sided quotation in the security or securities for which the member is registered as a market maker. Such rules, however, do not generally dictate the prices at which a market maker must quote. For example, when a market maker's liquidity has been exhausted, or if it is unwilling to provide liquidity, it may at that time submit what is called a stub quote – for example, an offer to buy a given stock at a penny – to comply with its obligation to maintain a continuous two-sided quotation.<sup>81</sup> Previously, market makers' quotations were required to be "reasonably related to the prevailing market." In requesting the deletion of this requirement, exchanges argued that the market structure had changed since the requirement was originally introduced in 1987 and that the requirement was no longer a meaningful means of ensuring market execution quality because of the highly competitive and increasingly automated environment of equities trading, and also because markets were required to abide by the trade-through protections of Regulation NMS.<sup>82</sup> In addition, it was believed that the duty of best execution would ensure that market makers with the most competitive quotations receive executions and thereby provide incentives for them to

<sup>80</sup> In addition, the Exchange Act does not require a national securities exchange to have market makers. See, e.g., Securities Exchange Act Release Nos. 61698 (March 12, 2010), 75 FR 13151 (March 18, 2010) (order granting the exchange registration of EDGX Exchange, Inc. and EDGA Exchange, Inc.).

<sup>81</sup> See, e.g. Nasdaq Rule 4613; NYSE Arca Equities Rule 7.23; and BATS Rule 11.8.

<sup>82</sup> See Securities Exchange Act Release No. 56586 (October 1, 2007), 72 FR 57085 (October 5, 2007) (SR-NASDAQ-2007-069).

quote at or near the NBBO, and that the quality of a market maker's executions could also be reviewed by looking at market execution quality reports.<sup>83</sup>

Certain exchanges have a single market maker for each security traded on that exchange. In the past, NYSE maintained a "specialist"-based market structure, with the specialist serving as the market professional that managed trading in the specific securities he was assigned.<sup>84</sup> The NYSE specialist was responsible for the execution of all orders coming into the Exchange, for conducting auctions on the NYSE floor, and for maintaining an orderly market in assigned securities. Specialists' dealer activities were governed, in part, by negative and affirmative trading obligations. Rule 11b-1 under the Exchange Act<sup>85</sup> requires exchanges that permit members to register as specialists to have rules governing specialists' dealer transactions so that their proprietary trades conform to the negative and affirmative obligations. The negative obligation as set forth in Rule 11b-1 under the Act requires that a specialist's dealings be restricted, so far as practicable, to those reasonably necessary to permit the specialist to maintain a fair and orderly market.<sup>86</sup> The affirmative obligation as set forth in Rule 11b-1 under the Act requires a specialist to engage in a course of dealings for its own account to assist in the maintenance, so far as practicable, of a fair and orderly market.<sup>87</sup>

In 2008, in order to adapt to the more electronic marketplace and increased competition from other trading venues, NYSE replaced its specialist system with a system of "Designated Market Makers" ("DMMs"). DMMs are similar to specialists in many ways, including in that there is only a single DMM on NYSE for each stock. Some obligations, such as the negative obligations specialists were subject to, no longer apply to DMMs. In addition, DMMs now have the ability to trade on parity with other market participants, as well as functionality reserved solely for DMMs that permits them to transmit a schedule setting forth additional liquidity that DMMs commit to provide in their assigned securities at specific price points. At the same time, DMMs are subject to other responsibilities, some the same as those previously imposed on specialists and others new. For example, DMMs are subject to quoting depth guidelines and are obligated to maintain a bid or an offer at the NBBO for a certain percentage of the trading day.

## (2) High Frequency Traders

Highly automated trading systems have helped enable a business model for a new type of professional liquidity provider that is distinct from the more traditional exchange specialist and over-the-counter ("OTC") market maker. In particular, proprietary traders

<sup>83</sup> *Id.*

<sup>84</sup> Section 11(b) of the Exchange Act allows the rules of a national securities exchange to permit a member to be registered as a specialist and act as both a broker and a dealer. 15 U.S.C. 78k(b).

<sup>85</sup> 17 CFR 240.11b-1.

<sup>86</sup> 17 CFR 240.11b-1(a)(2)(iii).

<sup>87</sup> 17 CFR 240.11b-1(a)(2)(ii).

now use high speed systems by submitting large numbers of orders that can result in more than 1 million trades per day by a single firm. These proprietary traders often are labeled as engaging in high-frequency trading (“HFT”), though the term does not have a settled definition and may encompass a variety of strategies in addition to passive market making.

HFT traders can be organized in a variety of ways, including as a proprietary trading firm (which may or may not be a registered broker-dealer and member of FINRA), as the proprietary trading desk of a multi-service broker-dealer, or as a hedge fund (all of which are referred to hereinafter collectively as a “proprietary firm”). Other characteristics often attributed to proprietary firms engaged in HFT are: (1) the use of extraordinarily high-speed and sophisticated computer programs for generating, routing, and executing orders; (2) use of co-location services and individual data feeds offered by exchanges and others to minimize network and other types of latencies; (3) very short time-frames for establishing and liquidating positions; (4) the submission of numerous orders that are cancelled shortly after submission; and (5) ending the trading day in as close to a flat position as possible (that is, not carrying significant, unhedged positions over-night). Given the competitive pressures to maximize their speed of trading, HFT firms typically will attempt to streamline the code for their trading algorithms. However, every check and filter in that code reduces its speed, creating a tension.

HFT is one of the most significant market structure developments in recent years. Estimates of HFT volume in the equity markets vary widely, though they often are 50 percent of total volume or higher.<sup>88</sup> By any measure, HFT is a dominant component of the current market structure and is likely to affect nearly all aspects of its performance. In addition, though the term HFT implies a large volume of trades, some of the concerns that have been raised about particular strategies used by proprietary firms do not necessarily involve a large number of trades. Indeed, any particular proprietary firm may simultaneously be employing many different strategies, some of which generate a large number of trades and some that do not. Conceivably, some of these strategies – for example, if they dampen short-term volatility or promote efficient pricing by narrowing spreads – may benefit market quality and long-term investors and others could be harmful.

#### **g) Relevant Equity Market Structure Features**

A number of features relating to the equity markets are relevant to the events of May 6, 2010 and are discussed below:

<sup>88</sup> See, e.g., Jonathan Spicer and Herbert Lash, Who’s Afraid of High-Frequency Trading?, Reuters.com, December 2, 2009 (available at <http://www.reuters.com/article/idUSN173583920091202>) (“High-frequency trading now accounts for 60 percent of total U.S. equity volume, and is spreading overseas and into other markets.”); Scott Patterson and Geoffrey Rogow, What’s Behind High-Frequency Trading, Wall Street Journal, August 1, 2009 (“High frequency trading now accounts for more than half of all stock-trading volume in the U.S.”).



**(1) Order Types**

*Market Orders:* In certain cases, and particularly for illiquid securities, a large order or influx of orders can soak up available liquidity across the market, resulting in an order, particularly if it is a market order, breaking through many price levels in an effort to obtain an execution at any price. A market order is an order to buy or sell a stock at the best available market price. Market orders do not require an execution at a specific price or price range. With market orders, the order submitted is generally assured an execution; however, there is no limit on what the execution price can be. This contrasts with limit orders, which are submitted with a specified limit price. Limit orders guard against executions at prices at which the order submitter is not willing to trade, though the trade-off is that the order may not be executed if the market suddenly moves away from the specified limit price.

Stop loss market orders are orders that turn into market orders when the stop price of the order is reached. When an investor places a stop loss market order to sell, the investor is instructing the broker to sell a stock at the market if it falls to a certain price. In a normal market, where liquidity exists as the stock price goes up or down, this strategy can protect an investor from taking a major loss if the stock drops significantly by selling at a predetermined price to minimize the loss. However, during times of extreme market volatility, the use of market orders when stop loss levels are triggered could result in executions at aberrant prices if all other liquidity has already been exhausted.

The rules of some exchanges provide a “collar” for market orders. For example, on BATS, any portion of a market order that would otherwise execute at a price more than \$0.50 or 5 percent worse than the NBBO at the time the order initially reaches the exchange, whichever is greater, will be cancelled.<sup>89</sup> BATS’s market order thresholds are intended to help avoid executions on BATS of market orders at prices that are significantly worse than the initial NBBO, particularly in thinly-traded securities. BATS market participants that intend to trade against liquidity at price points beyond the market order thresholds can specify that intent by instead submitting a marketable limit order.<sup>90</sup>

Similarly, on NASDAQ, subject to certain exceptions,<sup>91</sup> market orders (called “Unpriced Orders” on NASDAQ) are “Collared Orders” that, for any portion of a Collared Order that would execute at a price more than \$0.25 or 5 percent worse than the NBBO at the time when the order reaches NASDAQ, whichever is greater, will be cancelled. In proposing to adopt its collar for market orders, NASDAQ stated that it was intended to reduce the risk that unpriced orders might execute at prices significantly

<sup>89</sup> BATS Rule 11.9(a)(2).

<sup>90</sup> See Securities Exchange Act Release No. 34-59258 (January 15, 2009), 74 FR 4788 (January 27, 2009) (SR-BATS-2009-001).

<sup>91</sup> Unpriced Orders would not be Collared Orders for: (1) Market On Open Orders; (2) Market On Close Orders; (3) Unpriced Orders included in a Nasdaq Halt Cross or Nasdaq Imbalance Cross; or (4) Unpriced Orders that are Reference Price Cross Orders. See Nasdaq Rule 4751(e)(13).

worse than the NBBO. Nasdaq noted that market participants generally expect that their orders will be executed in full at a price reasonably related to the prevailing market, but that participants might not be aware if there is insufficient liquidity at or near the NBBO to fill the entire order, particularly for thinly-traded securities.<sup>92</sup>

*Intermarket Sweep Orders:* Regulation NMS also introduced the use of intermarket sweep orders. An intermarket sweep order is a limit order that meets the following requirements: (1) when routed to a trading center, the limit order is identified as an intermarket sweep order; and (2) simultaneously with the routing of the limit order identified as an intermarket sweep order, one or more additional limit orders, as necessary, are routed to execute against the full displayed size of all protected quotations with a superior price.<sup>93</sup> These additional limit orders must be marked as intermarket sweep orders to allow the receiving market center to execute the order immediately without regard to better-priced quotations displayed at other trading centers (by definition, each of the additional limit orders would meet the requirements for an intermarket sweep order).

A trading center may immediately execute any order identified as an intermarket sweep order.<sup>94</sup> It therefore need not delay its execution for the updating of the better-priced quotations at other trading centers to which orders were routed simultaneously with the intermarket sweep order. A trading center itself may also route out intermarket sweep orders and thereby clear the way for immediate internal executions at the trading center.<sup>95</sup>

<sup>92</sup> See Securities Exchange Act Release No. 60371 (July 23, 2009), 74 FR 38075 (July 30, 2009) (SR-Nasdaq-2009-070).

<sup>93</sup> Rule 600(b)(3) of Regulation NMS. 17 CFR 242.600(b)(3).

<sup>94</sup> Rule 611(b)(5) of Regulation NMS. 17 CFR 242.611(b)(5).

<sup>95</sup> Rule 611(b)(6) of Regulation NMS. 17 CFR 242.611(b)(6).

To illustrate the operation of intermarket sweep orders, assume that a broker-dealer's customer wished to sell a large amount of a stock. Trading Center A is displaying the national best bid of 500 shares at \$10.00, along with quotations in its proprietary depth-of-book data feed of 1500 shares at \$9.99, and 5000 shares at \$9.97. The customer decides to sweep all liquidity on Trading Center A down to \$9.97. Assume also that Trading Center B is displaying a protected bid of 2000 shares at \$9.99, Trading Center C is displaying a protected bid of 400 shares at \$9.98, and Trading Center D is displaying a protected bid of 200 shares at \$9.97. The broker-dealer could execute this trade for its customer, subject to its best execution responsibilities, by simultaneously routing the following orders: (1) an intermarket sweep order to Trading Center A with a limit price of \$9.97 and a size of 7000 shares; (2) an intermarket sweep order to Trading Center B with a limit price of \$9.99 and a size of 2000 shares; and (3) an intermarket sweep order to Trading Center C with a limit price of \$9.98 and a size of 400 shares.

All of these orders would meet the requirements of the definition of intermarket sweep orders because the necessary orders simultaneously were routed to execute against the displayed size of all better-priced protected quotations. Trading Centers A, B, and C all could execute their orders immediately without regard to the protected quotations displayed at other trading centers. No order would need to be routed to Trading Center D because the price of its bid was not superior to the most inferior limit price of the order routed to Trading Center A. Assuming the customer obtained a fill for each of its orders at the displayed prices and sizes, it would have been able to

**(2) Temporary Unavailability of Market-Specific Liquidity**

*Liquidity Replenishment Points:* NYSE utilizes a hybrid floor/electronic trading model, unlike most other markets today which are fully electronic. In attempting to meld the traditional open-outcry floor-based auction model with today's technology, NYSE's trading system utilizes what are known as "liquidity replenishment points" ("LRPs").<sup>96</sup> LRPs are best thought of as a "speed bump" and are intended to dampen volatility in a given stock by temporarily converting from an automated market to a manual auction market when a price movement of sufficient size is reached. In such a case, trading on NYSE in that stock will "go slow" and pause for a time period to allow the Designated Market Maker to solicit additional liquidity before returning to an automated market. This "speed bump" occurs even when there may be additional interest on NYSE's book beyond the LRP price point.

LRPs are calculated by NYSE automatically throughout the trading day. Specifically, the LRP is calculated upon the opening trade of the day in the security or, if there is no opening trade, on the opening quote, and is recalculated (i) every 30 seconds thereafter based on the last sale; (ii) after a manual trade by the DMM; (iii) when automatic executions resume after an LRP is reached; and (iv) upon the first sale or quote after automatic executions resume following an LRP. The precise LRP value varies according to the security's share price and average daily volume within specified ranges. LRPs are calculated by adding or subtracting the LRP value to the last sale price or quote as appropriate on the exchange in the relevant security.<sup>97</sup>

When an incoming order on the NYSE would result in an execution [at or] outside an LRP or the stock is quoted outside an LRP, automatic executions in the security are suspended on that side of the market. In addition, NYSE will suspend automated quotations in the security, and will identify its quote on the consolidated tape with a "non-firm" indicator. This is referred to as a "slow market" or "going slow" in the security. NYSE will resume automated quotations and automatic executions as soon as possible after an LRP is reached, once the DMM manually determines the reopening price. In many cases, this occurs in a fraction of a second, but when the market is particularly volatile, it can take a minute or more. Upon resumption of automatic executions, a new LRP is calculated for the security. On days of major market volatility, stocks with significant and continual declines may cause NYSE trading to remain in the "go slow" mode for extended periods or to intermittently return to automated execution status before quickly again hitting another LRP and thereby "going slow" again.

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obtain an immediate execution of a 9400-share trade by sweeping through four price levels at Trading Center A, while also honoring the protected quotations at two other trading centers.

<sup>96</sup> For example, if the last sale price in a security is \$20 and the LRP value is \$0.40, an LRP would be reached at \$20.40 on the upside or \$19.60 on the downside.

<sup>97</sup> NYSE Rule 1000(a)(iv).

*Self-Help:* An exchange may exclude the quotations of another exchange from its determination of whether the other exchange has a better “protected” price to which it must route orders for execution under Regulation NMS if that other exchange is experiencing a failure, material delay, or malfunction in its systems or equipment.<sup>98</sup> This is known as invoking “self-help” against the other exchange.<sup>99</sup> This mechanism gives trading centers a remedy if another trading center repeatedly fails to provide an immediate response (within one second) to incoming orders attempting to access its quotes.

### (3) Stub Quotes

As noted above, in order to comply with their obligation to maintain continuous two-sided quotations, market makers are permitted under the rules of certain exchanges to utilize stub quotes. When a market order is submitted to an exchange, the order immediately will seek the best available liquidity, including the protected quotes of other markets, regardless of price. In times of market stress, if the only liquidity available is, for example, a one-cent stub quote, the market order, by its terms, will execute against the stub quote.

### (4) Clearly Erroneous Executions Rules

Erroneous trades can result from a variety of causes, including human error or computer malfunction. Because the markets today are increasingly fast, automated, and interconnected, an erroneous trade on one market can very rapidly trigger a wave of similarly erroneous trades on other markets.<sup>100</sup>

The equities exchanges have each adopted “clearly erroneous execution rules” that are designed to permit them to break trades that are clearly erroneous. Under these rules, which were last revised in late 2009 to make them more consistent across the various exchanges, an exchange member may request that an exchange officer review a potentially erroneous execution and declare it null and void. Alternatively, an equities exchange may review potentially erroneous executions on its own motion.

The clearly erroneous execution rules recognize that, in most circumstances, trades that are executed between parties should be honored. On rare occasions, however, the price of the executed trade indicates a “clearly erroneous error” may exist, suggesting

<sup>98</sup> Rule 611(b)(1) of Regulation NMS. 17 CFR 242.611(b)(1).

<sup>99</sup> See Question 4.07 of Responses to Frequently Asked Questions Concerning Rule 611 and Rule 610 of Regulation NMS, available at <http://sec.gov/divisions/marketreg/nmsfaq610-11.htm#sec4> (detailing the elements that must be included in a trading center’s policies and procedures to implement the self-help exception).

<sup>100</sup> For example, if the last trade in a stock is \$20, and a computer malfunction at one firm causes a series of trades to occur on multiple exchanges at prices exceeding \$50, the automated systems of other firms may quickly follow, with erroneous trades rapidly impacting multiple markets and market participants.

that it is unrealistic to expect that the parties to the trade had come to a meeting of the minds regarding the terms of the transaction and that the trade should be broken.

In determining whether to break trades, the rules permit equities exchanges to consider breaking a trade only if the price exceeds the consolidated last sale price by more than a specified percentage amount: 10% for stocks priced under \$25; 5% for stocks priced between \$25 and \$50; and 3% for stocks priced over \$50. These percentage thresholds may be (i) doubled for executions occurring between 9:30 a.m. and 10:00 a.m., when the S & P 500 Futures are up or down between 3% and 5% at 9:15 a.m. or (ii) tripled when the S & P 500 Futures are up or down 5% or greater at 9:15 a.m.

The equities exchanges also may consider additional factors to determine whether an execution is clearly erroneous, including but not limited to, system malfunctions or disruptions, volume and volatility for the security, news released for the security, whether trading in the security was recently halted/resumed, whether the security was subject to a corporate action, overall market conditions, consideration of primary market indications, and executions inconsistent with the trading pattern in the stock.

When an event involves erroneous trades that occur in multiple markets, the rules provide that the equities exchanges may use a higher percentage threshold in an effort to coordinate a result across markets. Although not required by the rules, the markets generally convene conference calls to discuss coordinated action when such events occur. Each exchange, however, retains the right to make its own determination on whether to nullify trades.

Pursuant to exchange rules, a clearly erroneous determination may generally be appealed, unless a determination is made that the number of the affected transactions is such that immediate finality is necessary to maintain a fair and orderly market and to protect investors and the public interest. In addition, the equities markets generally do not allow appeals of clearly erroneous rulings that are made in conjunction with other market centers.

This was the clearly erroneous execution framework in existence on May 6, 2010.

#### **(5) Short Sales**

Short selling is defined by Rule 200 of Regulation SHO as “any sale of a security which the seller does not own or any sale which is consummated by the delivery of a security borrowed by, or for the account of, the seller.”<sup>101</sup> Short selling often can play an important role in the market for a variety of reasons, including contributing to efficient price discovery, mitigating market bubbles, increasing market liquidity, promoting capital formation, facilitating hedging and other risk management activities, and limiting upward

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<sup>101</sup> 17 CFR 242.200(a).

market manipulations. There are, however, circumstances in which short selling can be used as a tool to manipulate the market.<sup>102</sup>

Due to its concerns regarding persistent fails to deliver<sup>103</sup> and potentially abusive “naked” short selling, the SEC adopted Regulation SHO, which became effective in early 2005.<sup>104</sup> As adopted in 2005, this Regulation imposed three general requirements with respect to short sales: a marking requirement, a locate requirement and a close-out requirement. Since 2005, the SEC has adopted several amendments to Regulation SHO. Two of the most recent amendments included further tightening the Regulation’s close-out requirement and adding a short sale price test restriction.

In connection with further tightening the Regulation’s close-out requirement, in the fall of 2008, the SEC adopted temporary Rule 204T of Regulation SHO, with an expiration date of July 31, 2009.<sup>105</sup> Temporary Rule 204T strengthened the close-out requirements of Regulation SHO for fails to deliver resulting from sales of any equity security. Prior to the adoption of temporary Rule 204T, Regulation SHO’s close-out requirement had applied only to those securities with a persistent and substantial level of fails to deliver (known as “threshold securities”). Due to the positive impact that temporary Rule 204T, as well as other recent SEC actions, had on reducing fails to deliver in equity securities, the SEC made the requirements of temporary Rule 204T permanent, with some limited modifications.<sup>106</sup>

<sup>102</sup> For example, in 2003, the SEC settled a case against certain parties relating to allegations of manipulative short selling in the stock of a corporation. The Commission alleged that the defendants profited from engaging in massive “naked” short selling that flooded the market with the stock, and depressed its price. See *Rhino Advisors, Inc. and Thomas Badian*, Lit. Rel. No. 18003 (Feb. 27, 2003); *SEC v. Rhino Advisors, Inc. and Thomas Badian*, Civ. Action No. 03 civ 1310 (RO) (S.D.N.Y.); see also *U.S. v. Russo*, 74 F.3d 1383, 1392 (2d Cir. 1996) (short sales were sufficiently connected to the manipulation scheme as to constitute a violation of Exchange Act Section 10(b) and Rule 10b-5); *S.E.C. v. Gardiner*, 48 S.E.C. Docket 811, No. 91 Civ. 2091 (S.D.N.Y. Mar. 27, 1991) (alleged manipulation by sales representative by directing or inducing customers to sell stock short in order to depress its price).

<sup>103</sup> A fail to deliver occurs when a seller fails to deliver securities to the buyer when delivery is due.

<sup>104</sup> See Securities Exchange Act Release No. 50103 (July 28, 2004), 69 FR 48008 (August 6, 2004).

<sup>105</sup> See Securities Exchange Act Release No. 58733 (October 14, 2008), 73 FR 61706 (October 17, 2008); see also Securities Exchange Act Release No. 58572 (September 17, 2008), 73 FR 54875 (September 23, 2008).

<sup>106</sup> See Securities Exchange Act Release No. 60388 (July 27, 2009), 74 FR 38266 (July 31, 2009). Under Rule 204, if a firm that clears and settles trades has a fail to deliver position at a registered clearing agency in any equity security for a short sale transaction in that equity security, the firm must, by no later than the beginning of regular trading hours on the settlement day following the settlement date, referred to as T+4, immediately close out the fail to deliver position by borrowing or purchasing securities of like kind and quantity. If the fail to deliver position results from a long sale or bona fide market making activity, the firm must, by no later than the beginning of regular trading hours on the third settlement day following the settlement date, referred to as T+6, immediately close out the fail to deliver position by borrowing or purchasing securities of like kind and quantity. If a firm that clears and settles trades does not purchase or borrow shares, as applicable, to close out a fail to deliver position in accordance with Rule 204, the firm, and any broker-dealer from which it receives trades for clearance and settlement, must borrow or arrange

With respect to adding a short sale price test restriction, in February 2010, the SEC approved Rule 201 of Regulation SHO, which restricts short selling in NMS stocks to a price above the national best bid after a stock's price has declined by 10% or more from the prior day's closing price.<sup>107</sup> The Rule became effective on May 10, 2010 and has a six month implementation period. Thus, compliance with the Rule was not required on May 6, 2010.

Rule 201 requires a trading center to establish, maintain, and enforce written policies and procedures that are reasonably designed to prevent the execution or display of a short sale order of an NMS stock at a price that is less than or equal to the current national best bid once the circuit breaker has been triggered. The price test restriction, once in effect, will apply to all short sales in that stock for the remainder of the day and the following day, unless an exception applies. Under the Rule, the listing market for the NMS stock must determine whether the stock's price has decreased by 10% or more from its prior day's closing price. The listing market must then immediately notify the single plan processor responsible for consolidating information for the NMS stock that the circuit breaker has been triggered. The single plan processor is then required to disseminate the information to the markets.

## 2. Overview of Listed Options Markets

A listed option is any option traded on a registered national securities exchange or automated facility of a national securities association. To date, all orders in listed options are executed only on registered national securities exchanges. The Options Clearing Corporation ("OCC"), a clearing agency registered with the SEC, is considered the issuer and guarantor of each listed options contract, and all listed options transactions are centrally cleared through OCC.

Listed options are currently traded on eight national securities exchanges, owned by six entities. These eight exchanges are BATS, BOX (a facility of BX), CBOE, ISE, NASDAQ OMX Phlx, NOM (a facility of Nasdaq), NYSE Amex, and NYSE Arca. Based on market share data for April 2010 obtained from the OCC,<sup>108</sup> the exchange with the highest market share of option volume was CBOE, with 33.88%. The two exchanges owned by The NASDAQ OMX Group, Inc. together had a market share of 23.91% (NASDAQ OMX Phlx had 21.51% and NOM had 2.40%). The two exchanges owned by NYSE Euronext together had a market share of 23.63% (NYSE Arca had 12.98% and NYSE Amex had 10.65%). ISE had a market share of 19.17% and BOX had a market share of 2.21%.

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to borrow securities prior to accepting or effecting further short sales in that security, until the firm closes out the fail to deliver position by purchasing securities of like kind and quantity and that purchase has cleared and settled at a registered clearing agency.

<sup>107</sup> See Securities Exchange Act Release No. 61595 (February 26, 2010), 75 FR 11232 (March 10, 2010).

<sup>108</sup> See Table 8.

Similar to NMS stocks, most listed options are traded on multiple exchanges. In contrast to some markets where trading is concentrated on a single exchange or market, because liquidity on the options markets is dispersed across eight exchanges, linking the various exchanges is critical to the successful operation of the national market system for listed options. The options exchanges have implemented a joint industry plan to enhance the linking of the trading of listed options across the multiple exchanges. Most recently, in August 2009, the options exchanges implemented a new plan (the “Options Plan”), approved by the SEC,<sup>109</sup> which includes a “trade-through” rule that prevents the execution of trades on one options exchange at prices lower than a Protected Bid or higher than a Protected Offer.<sup>110</sup> Each exchange adopted rules to implement the Options Plan that prohibit its members from effecting trade-throughs, subject to certain enumerated exceptions. The approach to trade-throughs under the Options Plan is similar to that taken by the SEC under Rule 611 of Regulation NMS.<sup>111</sup>

As with NMS stocks, linkage among options exchange is an important protection against trade-throughs because it provides a baseline assurance that: (1) marketable orders will receive at least the best displayed price, regardless of the particular exchange that executes the order or where the best price is displayed in the national market system; and (2) quotations that are displayed at one exchange will not be bypassed by trades with inferior prices at any other options exchange in the national market system.

The trade-through prohibition for listed options also helps promote linkages among exchanges by encouraging them, when they do not have available trading interest at the best price, to route marketable orders to an exchange that is displaying the best price. Although the options exchanges are not required to route orders to better prices (an exchange can, for example, cancel and return an order when it does not have the best price), competitive factors have led options exchanges to offer routing services to their customers. Pursuant to the Options Plan, the options exchanges effectively adopted a

<sup>109</sup> See Securities Exchange Act Release No. 60405 (July 30, 2009), 74 FR 39362 (August 6, 2009) (File No. 4-546).

<sup>110</sup> A “Protected Bid” “Protected Offer” means a bid or offer in an option series that is displayed by an Eligible Exchange, is disseminated pursuant to the Options Price Reporting Authority Plan (“OPRA Plan”), and is the Best Bid or Best Offer of an Eligible Exchange. A “Best Bid” or “Best Offer” means the highest bid price or the lowest offer price communicated by a member of an Eligible Exchange to any broker-dealer or to any customer at which such member is willing to buy or sell, either as principal or agent. “Eligible Exchange” means a national securities exchange registered with the Commission in accordance with Section 6(a) of the Exchange Act that, among other things, is a Participant Exchange in OCC and is a party to the OPRA Plan. See Sections 2(1), 2(2), 2(14), and 2(17) of the Options Plan.

The OPRA Plan is a national market system plan approved by the SEC pursuant to Section 11A of the Exchange Act and Rule 608 thereunder. See Securities Exchange Act Release No. 17638 (March 18, 1981), 22 S.E.C. Docket 484 (March 31, 1981).

<sup>111</sup> See *supra* note 58.



“private linkage” approach that relies exclusively on brokers to provide routing services among exchanges.<sup>112</sup>

Just like registered exchanges that trade NMS stocks, registered exchanges that trade listed options must undertake self-regulatory responsibility for their members and file their proposed rule changes for approval with the SEC. These proposed rule changes publicly disclose, among other things, the trading services and fees of exchanges.

The registered exchanges that trade listed options have various market structures. Some are fully electronic (such as ISE, BATS, and NOM), while others have hybrid models that combine electronic trading with floor trading (such as CBOE, NYSE Amex, and NASDAQ OMX Phlx). In addition, some of the options exchanges have in the past few years adopted the “maker-taker” pricing model that is prevalent in the markets trading NMS stocks. The introduction of the maker-taker model followed the reduction of the quoting increment in certain options in 2007.<sup>113</sup> Under this model, non-marketable, resting orders that offer (make) liquidity at a particular price receive a liquidity rebate if they are executed, while incoming orders that execute against (take) the liquidity of resting orders are charged an access fee. The SEC recently published for comment a proposal that would cap the amount of fees an options exchange could charge for executions against the best displayed prices of the exchange at \$0.30 per contract.<sup>114</sup> Exchanges typically charge a somewhat higher access fee than the amount of their liquidity rebates, and retain the difference as compensation.

Some other options exchanges use a “broker payment” model. These exchanges generally charge no or low fees for the execution of customers’ orders,<sup>115</sup> but often charge other types of fees on a per-transaction basis. For example, most options exchanges charge a surcharge or “royalty” fee for executions in certain index option classes. Many exchanges also charge a payment for order flow or “marketing” fee to market makers that trade with customer orders on the exchange. The exchange then

<sup>112</sup> Prior to the Options Plan, the options exchanges routed specific linkage orders through a stand-alone system, or hub, which acted as a centralized data communications network that electronically linked the options exchanges to one another. See Securities Exchange Act Release No. 60405, supra note 109.

<sup>113</sup> On January 26, 2007, the then-existing six options exchanges implemented a pilot program to quote certain options series in thirteen classes in one-cent increments. Nasdaq became a participant in this program on March 31, 2008, when it commenced trading on NOM, and BATS became a participant on February 26, 2010 when it commenced trading on BATS Options Exchange Market. Since 2007, the pilot program has been extended and expanded several times.

<sup>114</sup> See Securities Exchange Act Release No. 61902 (April 14, 2010), 75 FR 20738 (April 20, 2010).

<sup>115</sup> Exchanges that use the “broker payment” model also generally give priority to customer orders at the best price over other orders or quotations at that price. After customer orders are executed, the rules of “broker payment” options exchanges dictate how the remainder of an incoming order is allocated against resting non-customer orders or quotations. Exchanges that use a “broker payment” model do not give priority to orders from certain customers who are “professional” customers under exchange rules. “Professional” customers are treated on ISE, CBOE, NYSE Amex and Nasdaq OMX Phlx in the same manner as a broker-dealer for purposes of specified order execution rules, including priority rules.

makes the proceeds from such “marketing” fees available to collectively fund payment for order flow to brokers directing order flow to the exchange.

The registered options exchanges typically offer a wide range of order types for trading on their markets. Examples of order types include market orders,<sup>116</sup> limit orders, and intermarket sweep orders.<sup>117</sup> Some of the order types are displayable in full if they are not executed immediately. Others are un-displayed, in full or in part. For example, a reserve order type will display part of the size of an order at a particular price, while holding the balance of the order in reserve and refreshing the displayed size as needed.<sup>118</sup> In general, displayed orders are given execution priority at any given price over fully un-displayed orders and the un-displayed size of reserve orders.<sup>119</sup>

Unlike with NMS stocks, all listed option orders are executed on registered national securities exchanges. Thus, broker-dealers cannot internally execute trades in listed options in the over-the-counter market. Instead, all such trades must be sent to a registered exchange for execution pursuant to the exchange priority rules. In addition, there is one registered ATS that conducts a listed options business. Any orders matched by this ATS, however, must be sent to a registered exchange for execution pursuant to the exchange’s priority rules.

As with NMS stocks, in a dispersed and complex market structure with many different options exchanges offering a wide spectrum of services, brokers play a significant role in linking exchanges together into a unified national market system. Brokers compete to offer the sophisticated technology tools that are needed to monitor liquidity at many different venues and to implement order routing strategies. To perform

<sup>116</sup> See supra section entitled “Order Types.”

<sup>117</sup> See Section 2(9) of the Options Plan. Intermarket sweep orders in the options markets are functionally similar to the ISO order for NMS stocks. See supra notes 93-95 and accompanying text.

<sup>118</sup> See, e.g., NYSE Arca Options Rule 6.62 (defining NYSE Arca’s reserve order as a limit order with a portion of the size displayed and with a reserve portion of the size that is not displayed on NYSE Arca). See also Nasdaq Options Rule Ch. VI, Section I(e)(6) (defining NOM’s price improving order as an order to buy or sell an option at a specified price at an increment smaller than the minimum price variation in the security. Price improving orders that are available for display shall be displayed at the minimum price variation in that security and shall be rounded up for sell orders and rounded down for buy orders); and ISE Rule 715(c) and Supplementary Material .02 to ISE Rule 713 (defining ISE’s all-or-none order as a limit or market order that is to be executed in its entirety or not at all. These orders are contingency orders and have no priority on ISE’s limit order book. Such orders are not displayed in ISE’s best bid or offer but are maintained in the system and remain available for execution after all other trading interest at the same price has been exhausted).

<sup>119</sup> See, e.g., NOM Ch. VI, Section I(e)(6) (providing that the non-displayed portion of reserve orders are not displayed in the system, and have lower priority within the system than an equally priced order that is displayed within the system, regardless of time stamp); BATS Rule 21.8(a)(2) (generally providing that displayed interest has priority over non-displayed interest at the same price); and Supplementary Material .02 to ISE Rule 713 (all-or-none orders are maintained in the system and remain available for execution after all other trading interest at the same price has been exhausted).

this function, brokers may monitor the execution of orders at the various exchanges to assess the available liquidity. Using their knowledge of available liquidity, brokers can offer smart order routing technology to access such liquidity. Many brokers also offer sophisticated algorithms that will take the large orders of institutional investors and others, divide a large “parent” order into many smaller “child” orders, and route the child orders over time to different exchanges in accordance with the particular trading strategy chosen by the customer.

As with NMS stocks, the linkage function of brokers also is supported by a broker’s duty of best execution. This duty requires a broker to obtain the most favorable terms reasonably available when executing a customer order.<sup>120</sup> Of course, this duty is not the only pressure on brokers to obtain best execution. The existence of strong competitive pressure to attract and retain customers encourages brokers to provide high quality routing services to their customers.<sup>121</sup>

As with the trading of NMS stocks, liquidity on options exchanges is derived from orders to buy or sell particular options series as well as quotations submitted by members of an exchange that are registered as market makers. Generally, however, investors in listed options depend upon the liquidity supplied by professional liquidity providers, such as market makers, to a greater extent than in the market for NMS stocks. This is due in part to the greater dispersion of trading interest across the thousands of series of listed options.<sup>122</sup> Professional liquidity providers are proprietary traders in the business of providing liquidity to the market, often through the submission of quotations, as well as limit orders that rest on the electronic order books of exchanges. They include registered entities, such as exchange specialists and market makers, as well as unregistered proprietary trading firms that engage in passive market making and other types of trading strategies. Some types of professional liquidity providers have certain obligations, such as to provide liquidity whether the market is up or down and maintain fair and orderly markets. Other professional liquidity providers do not have such responsibilities.

In general, the rules of the options exchanges allow a member, on a voluntary basis, to register as a market maker, either on a class-by-class or series-by-series basis. Members registered as market makers have certain obligations. Pursuant to the options exchanges’ rules, the transactions of a market maker in its market making capacity generally must constitute a course of dealings reasonably calculated to contribute to the maintenance of a fair and orderly market. These exchange rules also generally require a market maker to maintain a continuous two-sided quotation in the options for which the member is registered for a specified percentage of the time, or in a specified number of

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<sup>120</sup> See *supra* note 77.

<sup>121</sup> Rule 606 of Regulation NMS requires brokers to publish quarterly reports on their routing practices, including the venues to which they route options orders for execution.

<sup>122</sup> Options of the same class that have the same standardized terms (e.g., strike price) comprise an options series. An options class is an option of the same type (put or call) with the same underlying security.

series or classes. For example, the NOM rules require that its market makers maintain a two-sided market on a continuous basis in at least 75% of the options series in which they are registered. On some options exchanges such rules also limit how wide a market maker can quote.<sup>123</sup> Other options exchanges, such as NOM, do not have any limitations on the price at which market makers can quote.

While the options exchanges' rules may contain provisions that provide for market makers, these rules do not require any particular member to register as a market maker.<sup>124</sup> Some exchanges do not trade options on their market unless there is at least one market maker registered in the class. At least one options exchange does allow options to trade without any market maker registered in the option.<sup>125</sup> Accordingly, an exchange may not have registered market makers even though its rulebook provides for them. In addition, the rules of the options exchanges permit multiple members to register as market makers for the same option. Some of the exchanges may have a "lead" or "primary" market maker assigned in a given option, while others do not.

Each options exchange has adopted an "obvious error rule" that is designed to permit the exchange to adjust or nullify options transactions that are obviously erroneous. An obvious error will be deemed to have occurred when the execution price of a transaction differs from the theoretical price<sup>126</sup> for the option by an amount equal to at least the specified minimum amount indicated in the rule. On some exchanges, an obvious error also will be deemed to occur if there are erroneous prints or quotes in the underlying, or if there are verifiable systems disruptions or malfunctions. If the options exchange determines to adjust the transaction price, the transaction price would be adjusted to the theoretical price plus or minus an adjustment penalty that is set forth in the rule. A member of an options exchange may request that its options transaction be reviewed. Several of the options exchanges also have the discretion to review options transactions on their own motion.

### 3. Overview of ETFs

As a general matter, exchange-traded products ("ETPs") are issuers of exchange-traded securities that give investors exposure to an investment benchmark or strategy. ETPs exist in a variety of legal forms, including exchange-traded funds ("ETFs") registered as investment companies under the Investment Company Act of 1940 ("1940 Act"), exchange-traded notes ("ETNs"), trust-issued receipts, commodity and currency

<sup>123</sup> See, e.g., Nasdaq OMX Phlx Rule 1014(c)(i)(A)(1) and (2).

<sup>124</sup> See *supra* note 80.

<sup>125</sup> See Securities Exchange Act Release No. 61735 (March 18, 2010), 75 FR 14227 (March 24, 2010).

<sup>126</sup> The theoretical price of an option is, for series that are traded on at least one other exchange, the last national best bid (for erroneous sell transactions) and the last national best offer price (for erroneous buy transactions) just prior to the trade.

trusts, and commodity pools. All ETPs register offers and sales of shares under the Securities Act of 1933 ("Securities Act"), and a national securities exchange lists the securities issued by the ETPs for trading on a secondary market.

An ETF is registered under the 1940 Act as an open-end investment company or a unit investment trust ("UIT"). Unlike typical open-end investment companies ("mutual funds") or UITs, ETFs issue and redeem shares only in large aggregations or blocks (such as 50,000 ETF shares) commonly called "Creation Units." Purchase and redemption orders for Creation Units are placed by or through participants in the Depository Trust Company that have executed a "Participation Agreement" with the distributor of the ETF ("Authorized Participants"). Authorized Participants may purchase a Creation Unit with a "Portfolio Deposit" equal in value to the aggregate net asset value ("NAV") of the ETF shares in the Creation Unit. The Portfolio Deposit generally consists of a basket of securities announced by the ETF's investment adviser or sponsor at the beginning of each business day and usually mirrors the composition of the ETF's portfolio. Under certain circumstances, the Portfolio Deposit may also consist of cash or of cash in lieu of certain securities. The value of a Creation Unit could range from hundreds of thousands of dollars to several million dollars. After purchasing a Creation Unit, an Authorized Participant may hold the ETF shares, or sell ETF shares to other investors. ETF shares are not redeemable from the ETF except when aggregated into Creation Units, and then only by or through Authorized Participants. Authorized Participants thus act as the intermediary between investors and the ETF.

Like operating companies or closed-end funds, ETFs register offers and sales of shares under the Securities Act, and a national securities exchange lists the ETF shares for trading. As with any listed security, investors also may trade ETF shares in off-exchange transactions. In either case, ETF shares trade at negotiated prices. The development of the secondary market in ETF shares depends upon the activities of market makers and upon the willingness of Authorized Participants to engage in purchase and sale transactions in ETF shares in the secondary market.

If an Authorized Participant presents a Creation Unit to the ETF for redemption, it generally receives a "Redemption Basket" that consists of securities identified by the ETF investment adviser or sponsor at the beginning of the day and that usually matches the Portfolio Deposit. In some circumstances, the Redemption Basket could also consist of cash or of cash in lieu of certain securities. As with purchases from the ETF, redemptions from the ETF are priced at NAV. An investor holding fewer ETF shares than the amount needed to constitute a Creation Unit may dispose of those ETF shares only by selling them in the secondary market at market price, which may be higher or lower than the NAV of the ETF shares. The investor also pays customary brokerage commissions on sales in the secondary market.

In the past, ETF shares have not typically traded in the secondary market at a significant premium or discount in relation to NAV because of the arbitrage opportunities inherent in the ETF structure. Under normal circumstances, if ETF shares begin to trade at a discount (i.e., a price less than NAV), arbitrageurs may purchase ETF shares in the

secondary market and, after accumulating enough shares to equal a Creation Unit, redeem them directly from the ETF at NAV if an Authorized Participant, or indirectly through that person, thereby acquiring the more valuable securities in the Redemption Basket. In purchasing the ETF shares for this purpose, arbitrageurs create greater market demand for the shares, which may raise the market price to a level closer to NAV. In contrast, if ETF shares trade at a premium (i.e., a price greater than NAV), arbitrageurs may purchase the securities in the Portfolio Deposit, use them to obtain the more valuable Creation Units from the ETF, and then sell the individual ETF shares in the secondary market to realize a profit. As the supply of individual ETF shares available in the secondary market increases, the price of the ETF shares may fall to levels closer to NAV. Market makers have also been able to maintain efficient markets in ETF shares even in the absence of an actual arbitrage transaction by hedging their exposures.

The 1940 Act does not provide for the ETF structure. Accordingly, ETFs that are registered as investment companies under the 1940 Act first must apply to the SEC to obtain exemptive relief from certain provisions of the 1940 Act to permit their unique operations. The SEC issued the first order to an ETF organized as a UIT in 1992, and began issuing orders to ETFs organized as open-end funds in 1996.<sup>127</sup> The SEC now has issued more than 88 orders to permit ETF operations. As of May 11, 2010, there were 843 ETFs operating in reliance on these orders with a combined total of approximately \$740 billion in net assets.

Unlike ETFs, ETNs are senior, unsecured, unsubordinated debt securities issued by banks. ETNs are similar to ETFs in that they offer exchange-traded securities that provide investment exposure to certain market benchmarks or strategies. However, ETNs do not hold portfolios of securities and are not registered as investment companies under the 1940 Act. An investor in an ETN is therefore exposed to the credit risk of the issuer. ETNs can be redeemed from the issuer in large blocks of securities such as 50,000, typically on a weekly basis. There are approximately 90 ETNs.

Other types of ETPs include trust-issued receipts. Trust-issued receipts represent interests in a fixed trust of specified securities. Unlike other types of ETPs, owners of trust-issued receipts have the same rights and privileges as if they owned the underlying securities beneficially outside of the trust structure, and can receive the reports and communications that the issuers of the underlying securities send to their respective beneficial owners. ETPs also include commodities and currency trusts, as well as commodity pools. While these ETPs trade like ETFs, their portfolios consist of physical commodities, currency, or futures, rather than securities, and they are not registered as investment companies under the 1940 Act.

<sup>127</sup> SPDR Trust, Series 1, Investment Company Act Rel. Nos. 18959 (September 17, 1992) (notice) and 19055 (October 26, 1992) (order) and The CountryBaskets Index Fund, Inc., Investment Company Act Rel. Nos. 21736 (February 6, 1996) (notice) and 21802 (March 5, 1996) (order).

## APPENDIX B

### Overview of the Futures Market Structure

A futures contract is an agreement to purchase or sell a commodity for delivery in the future at a price that is determined when the contract is bought or sold. Each party is obligated to fulfill the terms of the contract at the specified price. Futures contracts are used to assume or shift price risk, and most positions are satisfied by offset or cash settlement, rather than delivery of the underlying commodity or financial instrument.

#### 1. Designated Contract Markets

U.S. futures exchanges (designated by the CFTC as contract markets, as described below) are a critical component of the U.S. and world economies, providing significant benefits to the public at large as well as market participants.<sup>128</sup> Futures markets offer individuals and firms in a myriad of industries important vehicles for hedging economic risks,<sup>129</sup> resulting in more efficient production, lower costs, and other benefits. They also provide vital forums for discovering prices.<sup>130</sup> For these reasons, futures exchanges are affected with a significant national public interest. Further, as self-regulatory organizations, futures exchanges must exercise their regulatory authority effectively, impartially, and in the public interest. As essential forums for the execution of futures transactions and for price discovery, exchanges must ensure fair and financially secure trading facilities.<sup>131</sup> They must also fulfill self-regulatory responsibilities through programs and policies that help ensure market integrity, financial integrity, and the strict protection of market participants and the public.<sup>132</sup>

Futures contracts must be traded on CFTC-regulated exchanges, called Designated Contract Markets (DCMs) pursuant to Section 5 of the Commodity Exchange Act (CEA).<sup>133</sup> DCMs may allow access to their facilities to all types of traders, including retail customers. DCMs may list for trading futures or options contracts based on any underlying commodity, index, or instrument. To obtain and maintain a designation, a DCM must comply with the designation criteria and 18 core principles set forth in Sections 5(b) and 5(d) of the CEA and Part 38 of the CFTC's regulations.<sup>134</sup>

<sup>128</sup> Commodity Exchange Act (CEA) Section 3(a), 7 U.S.C. 5(a).

<sup>129</sup> Id.

<sup>130</sup> Id.

<sup>131</sup> See, e.g., CEA Section 5(b)(3), 7 U.S.C. 7(b)(3); CEA Section 5(b)(5), 7 U.S.C. 7(b)(5).

<sup>132</sup> See, e.g., CEA Section 5(b)(2), 7 U.S.C. 7(b)(2); CEA Section 5(b)(5), 7 U.S.C. 7(b)(5); CEA Section 5(d)(4), 7 U.S.C. 7(d)(4); CEA Section 5(d)(11), 7 U.S.C. 7(d)(11); CEA Section 5(d)(12), 7 U.S.C. 7(d)(12).

<sup>133</sup> CEA Section 5, 7 U.S.C. 7.

<sup>134</sup> CEA Section 5(b), 7 U.S.C. 7(b); CEA Section 5(d), 7 U.S.C. 7(d); 17 CFR 38.

The CFTC monitors the discharge of each DCM's self-regulatory responsibilities and ongoing compliance with the CEA and CFTC regulations, including the core principles applicable to DCMs, through its program of regular rule enforcement reviews. Periodic rule enforcement reviews examine, among other things, a DCM's audit trail, trade practice, disciplinary, and dispute resolution programs. Accurate audit trails are essential to reconstruction of trading such as that which occurred on May 6.

DCMs may implement new rules or rule amendments or list new products by filing with the CFTC a certification that the rule or rule amendment complies with the CEA and CFTC regulations and policies, or by requesting approval from the CFTC.<sup>135</sup>

Currently, there are 14 DCMs designated by the CFTC that are actively trading. The total trading volume on all of these exchanges combined in 2009 was approximately 2.7 billion contracts.

## **2. Futures Market Structure**

The market structure of U.S. futures markets differs from the market structure of U.S. equities markets. In the cash equity markets, the same security may be traded on multiple venues that are linked. Under current practice, a given futures contract trades on only one exchange. For example, the E-mini S&P 500 futures contract and the S&P 500 futures contract trade exclusively on the Chicago Mercantile Exchange (CME), and the Russell 2000 futures contract trades exclusively on ICE Futures U.S. Futures exchanges are not linked in the way securities trading venues are linked. Futures contracts are not "issued" by a public company for registration and listing on an exchange. Rather, futures exchanges design and list them for trading.

The equities and futures markets also differ with respect to clearing. Equities are cleared through the National Securities Clearing Corporation. Options on equities are cleared through the Options Clearing Corporation. In the futures markets, individual exchanges are responsible for maintaining the financial integrity of trading in their listed contracts. To fulfill this obligation, exchanges select the clearinghouse(s) that will clear and settle their contracts, a clearing model which is also known as "exchange-directed clearing."

The CEA requires that all CFTC-regulated DCMs have all DCM-traded contracts cleared and settled by a CFTC registered derivatives clearing organization (DCO).<sup>136</sup> One of the critical functions that each DCO performs is the removal of debt obligations among clearing members. At a minimum, this is done at the end of the trading session for a given trade date.<sup>137</sup> This process is accomplished by independently determining a

<sup>135</sup> CEA Section 5c(c), 7 U.S.C. 7a-2(c); 17 CFR Part 40.

<sup>136</sup> CEA Section 5(b)(5), 7 U.S.C. 7(b)(5).

<sup>137</sup> The DCO functions as the central counterparty and guarantor for the positions that result from all contracts traded on the DCM. This means that the DCO is the long to each short position and the short to each long position in all contracts that it clears. DCOs deal exclusively with clearing participants. Any market participant that is not a clearing member of a particular DCM must have



settlement (or marking) price for each contract that is cleared and marking all open positions to that price. The DCO collects cash from clearing members that have lost money on their positions and pays it to clearing members that have gained money on their positions.

Exchange-directed clearing has been the standard in the futures industry since the industry's inception. The clearinghouse associated with a futures exchange can be either vertically integrated into the exchange company itself, or serve as a third-party clearing services provider. Historically, most clearinghouses have been integrated into particular futures exchanges. The CEA mirrors the exchange-directed clearing model by placing upon exchanges the statutory obligation to ensure the financial integrity of their listed contracts.<sup>138</sup>

### 3. Equity Futures Products

#### a. Broad-Based Index Futures<sup>139</sup>

Stock index futures are financial instruments whereby traders buy or sell a standardized value of a stock index for settlement on a future date at a specified price. The fundamental economic purpose of stock index futures is to provide a risk management tool for financial institutions and other market participants active in the stock market. They are widely used by mutual funds, pension funds, endowments, foundations and other entities holding securities, as an effective way to protect against adverse price movements associated with holding stock portfolios by selling futures or as a way to efficiently manage the purchase and sale of stocks as portfolios are balanced or adjusted.

Stock index futures are cash settled and do not provide for delivery of the shares underlying the indices. For most stock index futures contracts, contract expiration is on the third Friday of the contract month. All open contracts are then settled in cash, based on the Special Opening Quotation price for the relevant index on the expiration day.<sup>140</sup> Each futures exchange establishes a contract size by specifying a multiplier. For example, with respect to the CME E-mini S&P 500 contract, the contract size is set at \$50 times the S&P 500 Index value, equal to a notional value of \$55,000 per contract when the index is at 1,100. Stock index futures are subject to price limits and circuit breaker trading halts that are coordinated with trading in the underlying securities markets (circuit breakers are discussed in more detail below). Trading and open interest

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its positions carried by a clearing member. The DCO for CME is the CME Clearing House, while the DCO for ICE Futures US is ICE CLEAR US.

<sup>138</sup> See CEA Section 5(b)(5), 7 U.S.C. 7(b)(5); CEA Section 5(d)(11), 7 U.S.C. 7(d)(11).

<sup>139</sup> A broad-based security index means a group or index of securities that does not constitute a narrow-based security index. 17 CFR 41.1(c).

<sup>140</sup> The "Special Opening Quotation" is calculated using normal index calculation procedures except that the values for the respective components are taken as the actual opening values for each of the component equities.

in stock index futures is concentrated in the nearby month, which typically accounts for over 90 percent of total activity in all months combined.

Two DCMs, CME and ICE Futures U.S., trade broad-based equity index futures, the CME and ICE Futures U.S. The combined total trading volume of all equity index products traded at CME and ICE in 2009 was approximately 766 million contracts.

Stock index futures contracts were introduced in the early 1980's, beginning with the Kansas City Board of Trade's Value Line Average futures contract and the CME's S&P 500 index futures contract. The CME and other futures markets have listed for trading futures on various broad market sector indices. These include the CME Nasdaq 100, S&P MidCap 400, and S&P Small Cap 600 index futures, the Chicago Board of Trade ("CBOT") Dow Jones Industrial Average Index future and the ICE Futures US Russell 2,000 index future. In addition, the CME and other exchanges list options on certain stock index futures contracts, including the CME E-mini S&P 500.

As noted, the CME first launched an S&P 500 futures contract in the early 1980s; that contract continues to trade today. That contract, however, has a larger contract size, \$250 times the level of the S&P 500, compared to the \$50 multiplier for the E-mini S&P 500 contract. The original S&P 500 contract is traded via open outcry during the day trading session and on CME Globex during overnight electronic trading hours, while the E-mini S&P 500 contract is traded exclusively on Globex. From Monday through Thursday, the E-mini S&P 500 contract trades from 4:30 to 5:30 p.m. and from 6:00 p.m. to 4:15 p.m. the following day. (It therefore trades until 4:15 p.m. on Friday.) It also trades from 6:00 p.m. Sunday through 4:15 p.m. Monday. Open outcry trading in the original S&P 500 contract, which takes place from 9:30 a.m. through 4:15 p.m. Monday through Friday, overlaps with electronic trading in the E-mini S&P 500 during those hours. Electronic trading in the original S&P 500 contract (which as noted above takes place only outside of its open outcry trading hours) also overlaps with the E-mini S&P 500 contract during overnight hours.

The E-mini S&P 500 contract was launched in 1997, as a smaller contract size version of the original S&P 500 futures contract. Since that time, trading volume and open interest in the E-mini version has grown dramatically such that, today, the E-mini S&P 500 contract is the most actively traded domestic stock index futures contract.<sup>141</sup>

Both the E-mini S&P 500 and the pit-traded S&P 500 futures contracts exhibit substantial trading volume and open interest. In April 2010, trading in the E-mini S&P 500 and the pit-traded S&P 500 futures contracts accounted for about 78 percent of the total trading volume and about 80 percent of total open interest of all domestic stock index futures contracts. For this same period, the E-mini S&P 500 contract alone accounted for about 77 percent of total US stock index futures and options activity. In this regard, in April 2010, the average daily trading volume in the E-mini S&P 500

<sup>141</sup> Total trading volume in the E-mini S&P 500 contract exceeded that of the pit-traded contract in 2006. In 2006, total trading volume in the E-mini S&P 500 contract was 257,926,680 contracts compared to 74,221,810 E-mini equivalent contracts for the pit-traded S&P 500 contract.

contract was about 2.1 million contracts, compared to about 17,000 contracts for the S&P 500 contract. As of the close on May 5, total open interest in the E-mini S&P 500 contract was about 2.6 million contracts (representing a notional value of about \$152.4 billion), compared to about 328,000 contracts for the S&P 500 contract. The \$152.4 billion notional value of the E-mini S&P 500 contract, however, represents only about one percent of the \$14.1 trillion notional value of the entire U.S. stock market, as represented by the Russell 3000 index.

The Russell 2000 Index Mini futures contract trades on ICE Futures U.S. It was originally listed in October 2001 on the CME but moved to ICE Futures U.S. in September 2008. April 2010 average daily volume for the contract was 150,885. Open interest as of May 5, 2010 was 392,394 representing 10% of total U.S. stock index futures open interest.

#### **b. Security Futures**

The term “security futures product” (SFP) encompasses security futures and options on security futures. Security futures includes both futures on a single security (called single stock futures) and futures on narrow-based security indices.

The Commodity Futures Modernization Act of 2000 (CFMA) lifted the ban on trading of futures contracts based on single stocks. A security future is a contract for the sale or future delivery of a single security or of a narrow-based security index.<sup>142</sup> Previously, these products were prohibited from being offered in the United States. With the passage of the CFMA, broad-based security index futures, which are not considered security futures products, continue to trade under the sole jurisdiction of the CFTC, while security futures products are subject to the joint jurisdiction of the CFTC and the SEC.<sup>143</sup>

Contract markets that have been designated by the CFTC may trade security futures products if they notice register with the SEC and comply with certain requirements of the Securities Exchange Act of 1934.<sup>144</sup> Likewise, national securities exchanges and national securities associations registered with the SEC may trade security futures products if they notice register with the CFTC and comply with certain requirements of the CEA.<sup>145</sup>

Only one DCM trades single stock and narrow based index futures contracts, OneChicago, which was designated as a contract market by the CFTC in 2002. At expiration of a single stock futures contract, the contract is settled by delivery of shares of the underlying stock. OneChicago lists 1,936 futures products, of which 233 are futures

<sup>142</sup> CEA Section 1a(31), 7 U.S.C. 1a(31); 17 CFR Part 41.

<sup>143</sup> CEA Section 2(a)(1)(C), 7 U.S.C. 2(a)(1)(C); CEA Section 2(a)(1)(D), 7 U.S.C. 2(a)(1)(D).

<sup>144</sup> CEA Section 5f, 7 U.S.C. 7b-1. See also, 17 CFR Part 41.

<sup>145</sup> 15 U.S.C. 78f(g)(2).

on Exchange Traded Funds. The total trading volume on OneChicago in 2009 was approximately 3 million contracts.

#### **4. Electronic Trading**

##### **a. History of Electronic Futures Trading**

Electronic futures trading began at both CME and CBOT in 1992. Over the almost two decades since then, electronic trading has come to be the prevalent form of trading in U.S. futures markets. Electronic trading volume surpassed open outcry trading volume at CBOT in 2004, at CME in 2005, and at the New York Mercantile Exchange (NYMEX) in 2007. As of the end of April 2010, electronic trading accounted for approximately 88 percent of the combined volume of all CME Group exchanges<sup>146</sup>—which collectively account for approximately 97 percent of all U.S. futures and options volume—while open outcry trading had declined to approximately 12 percent of the combined volume of those exchanges.<sup>147</sup> For example, in 2009, total trading volume for the S&P 500 futures contract was approximately 10.4 million contracts as compared to approximately 556 million contracts for the E-mini S&P 500 contract.

The IntercontinentalExchange, Inc. was launched as a fully electronic trading venue in 2000. It acquired the former New York Board of Trade, now ICE Futures U.S., whose markets traded only by open outcry, in 2006. ICE launched electronic trading at ICE Futures U.S. in 2007, and by the end of 2007 all futures contracts there were exclusively traded electronically, with only options on futures still traded by open outcry.

##### **b. Electronic Trading Platforms**

Equity index futures on U.S. futures exchanges are traded on two electronic trading systems, CME Group's Globex system and the IntercontinentalExchange, Inc.'s ICE Trading System.

CME Globex supports electronic trading at all CME Group exchanges. The CME Globex system also supports the electronic trading of partner exchanges including the Kansas City Board of Trade, Minneapolis Grain Exchange, Dubai Mercantile Exchange, BM&F Bovcspsa, and Korea Exchange. Launched in 1992, CME Globex is now accessed by customers in more than 85 countries and foreign territories, and is available for trading nearly 24 hours a day from Sunday evening to Friday afternoon. In the first quarter of 2010, CME Globex processed an average daily volume of approximately 9.5 million contracts for CME, CBOT, NYMEX and COMEX products.

<sup>146</sup> The CME Group exchanges include CME, CBOT, NYMEX, and the Commodity Exchange, Inc. (COMEX).

<sup>147</sup> Although all U.S. futures markets trade either exclusively on electronic trading systems or utilize a combination of floor trading and electronic trading, this discussion focuses solely on CME Globex and ICE Trading System, the systems used to trade the E-mini S&P 500 and the Russell 2000 equity index futures contracts.

The IntercontinentalExchange, Inc.'s ICE Trading System supports electronic trading at all ICE futures exchanges, including ICE Futures U.S. (regulated by the CFTC), ICE Europe (regulated by the United Kingdom's Financial Services Authority), and ICE Canada (regulated by Canada's Manitoba Securities Commission). It also supports electronic trading for ICE's OTC swaps markets in oil, electricity, and natural gas. It is accessed by customers in 50 countries and is available for trading for about 23 hours a day from Sunday evening through Friday afternoon. During April 2010, the ICE Trading System processed an average daily volume of about 428,000 contracts for ICE Futures U.S., and an overall combined average daily volume of almost 1.4 million contracts for all trading on the system.

### 5. Order Display and System Speed

CME's Globex system displays bid and offer prices and volume 10-deep in the order book for the E-mini S&P 500 contract, and the ICE Trading System displays the full depth of all bids and offers in the order book for all futures contracts traded on ICE Futures U.S. At both exchanges, traders can use front-end systems as an interface to enter their orders into the respective electronic trading system.<sup>148</sup> CME and ICE offer a range of different connectivity options to market participants. Market participants' decisions related to application design, network infrastructure, hardware and configuration affect how a participant accesses the market.

Once an order message is received by the Globex matching engine, the system affixes a time stamp to the order message and transmits it back to the end-user acknowledging the time of receipt at the matching engine. In the E-mini S&P 500 market on May 6, the average latency at the matching engine level during the period from 2:30 p.m. -3:00 p.m. was 3 milliseconds. The average latency during this period for market data updates to the last best price and 10-deep book was 1.5 milliseconds. Similarly, once an order message is received by the ICE Trading System's matching engine, the system affixes a time stamp to the order message and transmits it back to the end-user acknowledging the time of receipt at the matching engine. In the Russell 2000 market on May 6, the average latency at the matching engine level during the period from 2:30 p.m. -3:00 p.m. was 250 microseconds. The average latency during this period for market data updates to the last best price and full order book depth was 250 microseconds.

During the period from 2:30 p.m. to 3:00 p.m. on May 6 in the June E-mini S&P 500 index futures contract, the average number of trades per second was approximately 106 trades, and the average volume per second was approximately 600 contracts. The peak number of trades per second occurred at 1:43:21 p.m. with 889 trades. The peak volume in one second occurred at 2:46:51 p.m., with 4,456 contracts traded. In comparison, on May 13, the Thursday following May 6, the peak message volume in the

<sup>148</sup> "Front-end system" refers generally to the technology and infrastructure by which a trader interacts with an exchange's electronic trading system. Front-end systems provide the immediate interface through which orders are entered for transmission to the exchange, and through which market data is received by the trader. Front-end systems can be proprietary to the trader, furnished by third-party providers, or even provided by the exchange itself.

E-mini S&P 500 occurred between 9:30 a.m. - 10:00 a.m. The average volume per second was 133 contracts and the peak volume per second was 2,806 contracts. The average number of trades per second was 39 and the peak number of trades per second was 891 trades.

During the period from 2:30 to 3:00 p.m. on May 6 in the Russell 2000 index futures contract, the average number of trades per second was 32 trades, and the average volume per second was 44 contracts. The peak number of trades per second occurred at 2:41:41 p.m. with 320 trades. The peak volume in one second occurred at 2:41:44 p.m. with 431 contracts traded. For comparison, during the period of 2:30 p.m. -3:00 p.m. on May 13, the average volume per second was 11 contracts and the peak volume per second was 194 contracts. The average number of trades per second was 7.7 trades and the peak number of trades per second was 126 trades.

## 6. Co-location

A driving force behind the growth of electronic trading in the futures industry has been the continuing evolution of technologies for generating and executing orders. These technologies have improved the speed, capacity, and sophistication of trading functions that are available to market participants.

Many trading firms have trading strategies that are highly dependent upon speed in a number of areas: speed of market data delivery from exchange servers to the firms' servers; speed of processing of firms' trading engines; speed of access to exchange servers by firms' servers; and, speed of order execution and response by exchanges. For some trading firms, speed is now measured in microseconds, and any latency or delay in order arrival or execution can adversely affect their trading strategy. These trading firms are typically referred to as "high frequency" and/or "algorithmic" traders. High frequency traders are professional traders that use computer systems to engage in strategies that generate a large number of trades on a daily basis. Competition among high frequency traders has led to extensive use of co-location and/or proximity hosting services.<sup>149</sup>

Co-location and proximity services refer to trading market and/or certain third-party facility space that is made available to market participants for the purpose of locating their network and computing hardware closer to the trading market's matching engine. Along with space, co-location and proximity hosting services usually involve providing various levels of power, telecommunications, and other ancillary products and services necessary to maintain the trading firms' trading systems.

<sup>149</sup> Other characteristics of high frequency trading may also include: (1) the use of computer systems to generate, route and execute orders, (2) short time-frames for establishing and liquidating positions, (3) submission of numerous orders that are cancelled shortly thereafter, and/or (4) ending the trading day in a neutral overall position.

## 7. Futures Market Participants

As shown in the CFTC's Commitments of Traders (COT) reports, almost all of the participants in equity index futures markets are reportable traders on whom the CFTC regularly collects substantial information.<sup>150</sup> The vast majority of these traders are classified as "commercial traders."<sup>151</sup> For example, in the E-mini S&P 500 futures market, approximately 90 percent of all traders are reportable, and 70 percent are classified as commercial traders. The commercial category includes institutional investors such as pension funds, endowments, corporations, insurance companies, broker-dealers, large U.S. and non-U.S. commercial banks, and swaps dealers.

The remaining traders include hedge funds and other managed funds, as well as day traders. Day traders typically are in and out of the market rapidly, and usually do not maintain significant open interest from one trading day to the next, or even one hour to the next, although they may represent a significant portion of daily volume. A new type of futures market day trader, high frequency traders (described above), employ computer trading algorithms to spot market trends that signal when to enter and exit a market, and to execute their trading strategies. High frequency traders typically place large numbers of orders for small-quantities of contracts, either within a single market or across many different markets.

## 8. Order Entry

Participants in equity index futures markets place orders in a variety of ways. Some use the traditional method of telephoning an order to an exchange member firm, which takes the order and transmits it either to an electronic trading system or to an exchange floor.<sup>152</sup> The majority of participants, however, transmit their orders

<sup>150</sup> The COT reports provide a breakdown of each Tuesday's open interest for futures markets in which 20 or more traders hold positions equal to or above the reporting levels established by the CFTC. The information is available on the CFTC Website, [cftc.gov](http://cftc.gov).

<sup>151</sup> When an individual reportable trader is identified to the CFTC, the trader is classified either as "commercial" or "non-commercial." All of a trader's reported futures positions in a commodity are classified as commercial if the trader uses futures contracts in that particular commodity for hedging as defined in CFTC Regulation 1.3(z), 17 CFR 1.3(z). A trading entity generally gets classified as a "commercial" trader by filing a statement with the CFTC, on CFTC Form 40: Statement of Reporting Trader, that it is commercially "...engaged in business activities hedged by the use of the futures or option markets." To ensure that traders are classified with accuracy and consistency, CFTC staff may exercise judgment in re-classifying a trader if it has additional information about the trader's use of the markets. A trader may be classified as a commercial trader in some commodities and as a non-commercial trader in other commodities. A single trading entity cannot be classified as both a commercial and non-commercial trader in the same commodity. Nonetheless, a multi-functional organization that has more than one trading entity may have each trading entity classified separately in a commodity. For example, a financial organization trading in financial futures may have a banking entity whose positions are classified as commercial and have a separate money-management entity whose positions are classified as noncommercial.

<sup>152</sup> In the case of the open outcry S&P 500 futures contract, the member firm will transmit the order to CME's trading floor.

electronically themselves. Many of these orders are first transmitted to the exchange clearing member firm that guarantees that participant's trades, and then to the trading system. Some participants who have been approved by their clearing members and the exchange can transmit their orders directly to the trading system.

In 2008, CME implemented "Globex Credit Controls," a risk management system that enables intermediaries to set credit limits for each customer placing orders directly to Globex. While these risk limits are set by the intermediary firm, they are applied on an automated basis by the electronic trading system as a backstop to the firm's own risk management architecture. In April 2010, CME promulgated its Rule 949 and Advisory 10-153, which specifically require members to make use of these controls. Starting at the beginning of 2011, CME will be reviewing member firms' use of these controls (e.g., the reasonableness of the size of the limits) in light of the firms' financial resources.

ICE has an integrated pre-trade risk management system within the ICE Trading System to allow futures commission merchants to set credit limits for each customer placing orders into the system. Once set by the FCM, the limits are automatically applied to the user by the ICE Trading System. Modifications to the credit limits take effect in real-time in the trading system and can be made via the ICE website 24 hours a day, 7 days a week. These credit settings can be used as the primary risk management tool for firms or as a backstop to the firm's own risk management architecture. All participants who trade ICE U.S. Futures' contracts must utilize these controls to trade on the ICE trading system.

## 9. Market Making in Futures Markets

Futures exchanges are not required to have market makers. However, a futures exchange may enter into agreements with an exchange member calling for the member to act as a market maker on a specific product or products, in order to provide liquidity for new product or in low volume contracts.<sup>153</sup> Market maker agreements provide the market maker with certain incentives if the market maker, trading for its own account, complies with the particular obligations. These market maker agreements generally specify volume requirements and impose an affirmative duty on the market maker to make a continuous, two-sided market within some specified bid-ask spread in order to receive the incentives.<sup>154</sup> The requirement that the market maker provide its quotes in a particular bid-ask spread means that any quotes the market maker provides to qualify for the market maker program must be within a certain range of the then current market price.

<sup>153</sup> In the case of CME, it has market maker programs in the following equity index contracts: E-mini S&P MidCap 400 Futures, E-mini S&P MidCap 600 Futures, S&P 500 Technology Index Futures, S&P 500 Financial Sector Index Futures, E-mini MSCI EAFE Futures, E-mini MSCI Emerging Markets Index Futures, and E-mini Dow Futures (European Hours).

<sup>154</sup> Futures exchanges must also make the terms and conditions of market maker programs publicly available. See, Designation Criteria 7, CEA Section 5(b)(7), 7 U.S.C. 7(b)(7); Core Principle 7, CEA Section 5(d)(7), 7 U.S.C. 7(d)(7).



Market maker programs must comply with applicable core principles and designation criteria set out in the CEA,<sup>155</sup> and prior to its implementation, a program's criteria must be submitted to the CFTC, either by self-certification or for approval.<sup>156</sup> In reviewing market maker programs, the CFTC considers, among other things, whether market maker incentives would encourage wash or fictitious trading or other trading abuses. The CFTC also examines whether the exchange has adequate regulatory compliance mechanisms in place to detect trade practice abuses by market maker program participants.

#### **10. Existing Mechanisms to Promote Orderly Markets and Customer Protection**

Both CME Globex and the ICE Trading System have automatic safety features—termed “pre-trade risk management functionality”—to protect against errors in the entry of orders (such as “fat finger” errors), extreme price swings, and erroneous prices. As discussed below, these features help ensure fair and orderly markets.

First, CME Globex and the ICE Trading System both automatically reject orders priced outside a range of reasonability, also known as a “price band.”<sup>157</sup> For instance, on the E-mini S&P 500 futures contract, the price band is 12 points (approximately one percent) above and 12 points below the last executed trade.<sup>158</sup> This prevents clearly erroneous orders from entering the trading system and helps to prevent “fat finger” errors.

Second, both CME and ICE have maximum order size limitations that prevent entry into the trading system of an order that exceeds a maximum quantity established by the exchange. In the E-mini contract, for example, the maximum quantity is 2,000 contracts. This protection also helps to prevent “fat finger” errors. With the S&P 500 Index at 1,100 points as it was on May 6, two thousand E-mini contracts would have a notional value of \$110 million. The average transaction size in the E-mini contract, however, tends to be six contracts, or \$330,000.

<sup>155</sup> Market maker programs must comply, for example, with Core Principle 2—Compliance with Rules (monitor for trade practice abuses), Core Principle 9—Execution of Transactions (ensuring that the market remains open, competitive and efficient), Core Principle 12—Protection of Market Participants (fiduciary obligations to customers), and Core Principle 18—Antitrust Considerations, as well as Designation Criteria 3—Fair and Equitable Trading. See generally, CEA Section 5(b), 7 U.S.C. 7(b) and CEA Section 5(d), 7 U.S.C. 7(d).

<sup>156</sup> CEA Section 5c(c), 7 U.S.C. 7a-2(c). See also, 17 CFR 40.5; 17 CFR 40.6.

<sup>157</sup> The electronic trading functionality involved is known as “price banding functionality.” Generally, the price band is calculated dynamically by the system, based on the last traded price or the best bid or offer, and the price band thus moves dynamically with the market price, with its outer parameters remaining a fixed distance in points (12 in the case of the E-mini) above and below the market price. A “point” on a broad-based equity index, such as the S&P 500, is a concept used to measure the collective value of the securities included in the index.

<sup>158</sup> At CME and ICE Futures US, the number of points involved in the price band is set separately by each exchange for the products they trade.

Third, both CME Globex and the ICE Trading System have protections with regard to “stop loss” orders.<sup>159</sup> Such orders are triggered if the market declines to a level pre-selected by the person entering the order. CME and ICE rules provide that when the market declines to the trader’s pre-selected stop level for such an order, the order becomes a limit order executable only down to a price within the range of reasonability permitted by the system, instead of becoming a market order.<sup>160</sup> Requiring that stop orders have a limit avoids the possibility that such stop orders could be executed no matter how low the market goes. This requirement for all stop orders to convert to limit orders prevents, for example, any stop orders from being posted or executed at a price unreasonably below the market.

Fourth, CME Globex has “Stop Logic” functionality that protects against cascading stop orders—the domino effect of one stop order triggering others.<sup>161</sup> Globex’s Stop Logic functionality pauses trading—the pause is termed “the Stop Logic reserve period”—when the trading engine recognizes that it has a series of resting stop orders that could lead to a cascade and move the market up or down beyond a specified amount. The length of the Stop Logic reserve period varies by product and time of day. For the E-mini S&P 500, the period is 5 seconds from 9:30 a.m. to 4:15 p.m. and 10 seconds during the balance of the trading session. The pause allows new orders to enter the system to restore liquidity and balance to the order book.<sup>162</sup>

## 11. Trade Cancellation

Trade cancellation policies balance the adverse effects on market integrity of executing trades and publishing trade information inconsistent with prevailing market conditions. The intent is to preserve legitimate expectations that executed transactions will not be cancelled.

At CME, a “no-bust range” is established for each product traded electronically on CME Globex. Trade prices within the no-bust range—six points above or below the

<sup>159</sup> In the futures markets, however, a stop order as a limit order in the CME Globex and ICE systems. As a limit order, a trade cannot be executed at a price below its limit price.

<sup>160</sup> At CME, a market participant entering a stop loss order can pre-select a limit price only within a 12-point range of reasonability below the stop price. If the participant did not pre-select a limit price, the system defaults to a limit price three points below the stop price. At ICE, the participant can pre-select a limit price only within four points below the stop price, and the system defaults to a limit price four points below the stop price if no limit price is pre-selected.

<sup>161</sup> Absent this Stop Logic functionality, all stop orders at a particular price point would be triggered and traded on a first-in, first-out basis; additional resting stops would be triggered and traded as the market declined, and new orders would continue to be accepted and traded. While the protected range would still be operable, it would continuously adjust downwards with the market until a new equilibrium was reached, including, potentially, the execution of all resting stop orders in the order book.

<sup>162</sup> Globex’s Stop Logic functionality was originally developed to address thin markets in back contract months at times of night when open outcry markets were closed. However, it has played a role in volatile markets, such as the May 6 E-mini S&P 500 futures market.

market price in the case of the E-mini S&P 500 contract—will not generally be busted or adjusted. The only exception to this rule is if the Globex Control Center (GCC) determines that not busting or adjusting a trade within the no-bust range will have a material, adverse effect on the market.<sup>163</sup> Exchange rules state that the GCC can adjust trade prices or bust trades when such action is necessary to mitigate market disrupting events caused by the improper or erroneous use of the electronic trading system or by system defects. The GCC may review a trade based on its analysis of market conditions or on a request for review by a Globex user. A request for review must be made as soon as possible, but will generally not be considered if more than eight minutes have passed since the trade occurred. On May 6, CME received no requests to cancel any trades in the E-mini S&P 500 futures market, and CME did not cancel any trades.

ICE Futures U.S. has established a “No Cancellation Range” (“NCR”) for each ICE Futures U.S. product traded on its electronic platform. The NCR for the Russell 2000 Index Mini futures contract is 400 index points above or below the current anchor price (the anchor price is generally the last traded price). Trades within the NCR are not, under most circumstances, cancelled, whether as the result of error or otherwise. Traders generally have 5 minutes from the time of executing a trade in which to notify ICE Futures U.S. of an alleged error trade. ICE generally decides whether an alleged error trade will stand or be cancelled within 15 minutes after the time the alleged error trade occurred. On May 6, ICE received no requests to cancel any trades in the Russell 2000 contract, and did not cancel any trades.

## 12. Internalization of Orders by Futures Commission Merchants

In futures markets, FCMs can match orders in two limited ways. Such orders can be matched as a block trade or as an exchange of physicals for related positions transaction (“EFRP”), with the permission of customers.<sup>164</sup> However, all such transactions must be reported to the exchange promptly, and are included in the exchange’s audit trail and in market data the exchange subsequently transmits to market participants. If a block trade or EFRP is not executed, the FCM can match orders only if it follows strict exchange rules governing cross-trades, which require that, before the FCM can match such orders, they must be exposed to the market for a certain period of time during which they are visible to and available for matching by any market

<sup>163</sup> The GCC is the Market Operations and Customer Service desk for electronic trading on the Globex System. The GCC handles inquiries, issues, and support requests for the Globex platform, including electronic trading, order routing and market data interfaces, and network connectivity.

<sup>164</sup> Exchange of Futures for Related Positions includes, among other things, Exchange for Physicals (“EFP”), Exchange of Futures for Swaps (“EFS”), and Exchange of Futures for Risk (“EFR”). An EFP is a transaction in which the buyer of a cash commodity transfers to the seller a corresponding amount of long futures contracts, or receives from the seller a corresponding amount of short futures, at a price difference manually agreed upon. An EFS is a privately negotiated transaction in which a position in a physical delivery futures contract is exchanged for a cash-settled swap position in the same or a related commodity, pursuant to the rules of a futures exchange. An EFR is an exchange of futures for, or in connection with, over-the-counter derivative transactions.

participant. Both the orders and any resulting permissible cross-trade are included in the exchange's market data transmitted to market participants, as well as in the exchange's audit trail. This differs from the situation in equities markets, where orders internalized by broker-dealers may not be included in consolidated quotation data visible to the entire market.

### **13. Sources of Regulatory Data**

The CFTC's primary mission is fostering markets that accurately reflect the forces of supply and demand for the underlying commodity and are free of abusive trading practices. In this capacity, the CFTC conducts oversight of trade execution facilities through its market surveillance and market compliance programs.

The surveillance program identifies situations that could pose a threat of manipulation and to initiate appropriate preventive actions. Each day, for all active futures and option contract markets, CFTC staff monitors the daily activities of large traders, key price relationships, and relevant supply and demand factors in a continuous review for potential market problems. Surveillance is not conducted exclusively at the CFTC, surveillance issues are usually handled jointly by the CFTC and the appropriate futures exchange. Relevant surveillance information is shared and corrective actions are taken, when appropriate. Potential problem situations are jointly monitored and, if necessary, verbal contacts are made with the participants in question. These contacts may be for the purpose of understanding their trading, confirming reported positions, alerting the brokers or traders as to the regulatory concern for the situation, or warning them to trade responsibly. If an exchange fails to take actions that the CFTC deems appropriate, the CFTC has broad emergency powers under which it can order the exchange to take actions specified by the CFTC.

The CFTC's surveillance program uses many sources of market information to accomplish its objectives. Some of this information is publicly available, including data on the overall supply, demand, and marketing of the underlying commodity; futures, option, and cash prices; and trading volume and open interest data. Other information is highly confidential under statutory requirements, including data which identifies the activity or positions of individual traders.

Exchanges report the daily positions and transactions of each clearing member to the CFTC. The data are transmitted electronically during the morning after the "as of" date. They show, separately for proprietary and customer accounts, the aggregate position and trading volume of each clearing member in each futures and option contract. The data are used to identify the clearing firms that clear the largest buy or sell volumes or hold the biggest positions in a particular market.

The clearing member data do not identify the beneficial owners of the positions. Information on beneficial owners, however, is provided through the CFTC's large trader reporting system ("LTRS"). Under the CFTC's LTRS, clearing members, FCMs, and foreign brokers (collectively called reporting firms) file daily reports with the CFTC

pursuant to Part 17 of the CFTC's regulations, 17 CFR Part 17. As is the case with clearing member data, the data are transmitted electronically during the morning after the "as of" date. The reports show futures and option positions of traders with positions at or above specific reporting levels as set by the CFTC. Current reporting levels are found in CFTC Regulation 15.03(b), 17 CFR 15.03(b).<sup>165</sup>

If, at the daily market close, a reporting firm has a trader with a position at or above the CFTC's reporting level in any single futures or option expiration month, the firm reports that trader's entire position in all futures and options expiration months in that commodity, regardless of size. The CFTC uses addition information obtained from the reporting firms—i.e., CFTC Form 102: Identification of "Special Accounts"—and traders themselves—i.e., Form 40 "Statement of Reporting Trader"—to aggregate positions of a trader that may exist across multiple accounts or firms.

The CFTC also collects trade data on a daily, transaction date + 1 ("T+1"), basis from all U.S. futures exchanges through "Trade Capture Reports." Trade Capture Reports contain trade and related order information for every matched trade facilitated by an exchange, whether executed via open outcry or electronically, or non-competitively (e.g., block trades, exchange for physical, etc.). Among the data included in the Trade Capture Report are trade date, product, contract month, trade execution time, price, quantity, trade type (e.g., open outcry outright future, electronic outright option, give-up, spread, block, etc.), trader ID, order entry operator ID, clearing member, opposite broker and opposite clearing member, order entry date, order entry time, order number, customer type indicator, trading account numbers, and numerous other data points. Additional information is also required for options on futures, including put/call indicators and strike price, as well as for give-ups, spreads, and other special trade types.

All transactional data is received overnight, loaded in the CFTC's databases, and processed by specialized software applications that detect patterns of potentially abusive trades or otherwise raise concern. Alerts are available to staff the following morning for more detailed and individualized analysis using additional tools and resources for data mining, research, and investigation.

Time and sales quotes for pit and electronic transactions are also received from the exchanges daily. CFTC staff is able to access the market quotes to validate alerts as well as reconstruct markets for the time periods in question. Currently, staff is working with exchanges to receive all order book information in addition to the executed order information already provided in the Trade Capture Report. This project is expected to be completed within the next year; at present such data remains available to staff through "special calls" (described below) requesting exchange data.

In addition to information received daily, the CFTC may also obtain information through what is referred to as a Special Call. Under CFTC Regulation 18.05, every trader

<sup>165</sup> The current reporting levels, in number of contracts, for securities products are as follows: S&P 500 Index, 1,000; Other Broad-Based Securities Indices, 200; Individual Equity Securities, 1,000; and Narrow-Based Security Indices, 200.

who holds or controls a reportable futures or option position is required to keep books and records showing details concerning all positions and transactions in the commodity, as well as details concerning all positions and transactions in the cash commodity, and all commercial activity that the trader hedges in the futures or option contract in which the trader is reportable.<sup>166</sup> Such information must be made available to the CFTC upon request. A current use of the special call provision is in the capture of relevant information of index activity in commodity markets. To obtain the necessary data on OTC swap agreements, CFTC staff issued a special call to financial firms to receive data about the index activity of a variety of investors.

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<sup>166</sup> 17 CFR 18.05.

## APPENDIX C

### Cross-Market Circuit Breakers

Circuit breakers are coordinated, cross-market trading halts that were designed to operate during significant market declines and to substitute orderly, pre-planned halts for the *ad hoc* trading halts which can occur when market liquidity is exhausted. Circuit breakers also provide opportunities for markets and market participants to assess market conditions and potential systemic stress during a historic market decline. The U.S. securities and futures markets adopted circuit breaker procedures in October 1988 in response to their experiences during the historic market declines of October 1987 and to recommendations contained in studies of the pricing and liquidity problems that arose during the sharp price swings and volume surges on October 20, 1987, that came close to shutting down the markets.

In addition, futures exchanges have “price limits” for stock index futures contracts.<sup>167</sup> These price limits were also adopted in response to the historic market declines in October 1987. A price limit, in itself, does not halt trading in the futures, but prohibits trading at prices below (and sometimes above) the pre-set limit based on the previous session’s settlement price. Intra-day price limits are removed at pre-set times during the trading session, such as 10-minutes after the futures are determined to be “locked limit” down (up).<sup>168</sup> Daily price limits remain in effect for the entire trading session. Specific price limits are set for each stock index futures contract.

#### 1. Cross-Market Circuit Breaker Halts

##### a. The October 1987 Market Break and the Adoption of Circuit Breakers in 1988

In October 1987, the U.S. securities markets experienced an extraordinary surge in price volatility and trading volumes (“October 1987 Market Break”). On Monday, October 19, the DJIA declined 508 points, representing a record one-day decline of almost 23%. On October 20, the DJIA again declined sharply before share prices stabilized. The combination of historic price swings and unprecedented trading volumes overwhelmed the operational capacities and liquidity of the securities and futures markets. By mid-day on October 20, heavy selling pressure had produced large order imbalances and numerous *ad hoc* trading halts in individual stocks. Liquidity and pricing difficulties also resulted in uncoordinated mid-day trading suspensions on major options

<sup>167</sup> While price limits are common in futures contracts, there are no price limits for stocks, equity options or index options.

<sup>168</sup> A futures contract is found to be “locked limit” if exchange officials determine that prices are consistently at the limit price. A price decline that touches a limit but quickly bounces back will not trigger a “locked limit” determination.

exchanges and several large stock index futures exchanges. While the subsequent rally in market prices in the afternoon averted more widespread financial problems, the near shutdown of the markets on October 20 became a central focus of several studies of the October 1987 Market Break and resulted in the adoption of circuit breaker procedures in 1988.

Immediately following the October 1987 Market Break, the Presidential Task Force on Market Mechanisms was established with Nicholas F. Brady as Chairman. The report issued by the Task Force on January 8, 1988 ("Brady Report") recommended a number of initiatives to address future periods of extreme market volatility, including the implementation of circuit breaker mechanisms coordinated across the markets for stocks, options, and stock index futures. The Brady Report noted that the market disorders of October 1987 "became, in effect, *ad hoc* circuit breakers, reflecting the natural limits to market liquidity." Accordingly, the Brady Report maintained that the October 1987 Market Break "demonstrates that it is far better to design and implement coherent, coordinated circuit breaker mechanisms in advance, than to be left at the mercy of the unavoidable circuit breakers of chaos and system failure."<sup>169</sup>

After the issuance of the Brady Report, the President's Working Group on Financial Markets ("Working Group") was formed with the mandate to determine the extent to which coordinated regulatory action was necessary to strengthen the nation's financial markets.<sup>170</sup> The May 1988 Interim Report ("Interim Report") of the Working Group recommended a number of initiatives to assist the markets in coping with future periods of extraordinary price swings and volume surges, including the adoption of circuit breakers that would provide coordinated trading halts and reopenings for large, rapid market declines that threaten to create panic conditions.<sup>171</sup> The Working Group recommended that all U.S. markets for stocks, options, and futures halt trading for one hour if the DJIA declined 250 points from its previous day's closing level and halt trading for two hours if the DJIA declined 400 points from its previous day's closing level.<sup>172</sup> In addition, the Working Group anticipated quarterly reviews of the circuit breaker thresholds to determine whether changes in index levels necessitated changes to the triggers so that they continue to reflect percentage declines approximately equivalent to 12% and 20%.<sup>173</sup>

Partly in response to the October 1987 Market Break and the recommendations of the Brady Report and the Working Group, the securities and stock index futures markets submitted proposals to the SEC and CFTC in 1988 to implement circuit breakers that would impose temporary trading halts following significant market declines. The circuit

<sup>169</sup> See *Report of the Presidential Task Force on Market Mechanisms* (January 1988) at 66.

<sup>170</sup> The Working Group, established in March 1988, consists of the Secretary of the Treasury and the Chairmen of the SEC, CFTC, and the Board of Governors of the Federal Reserve System.

<sup>171</sup> See *Interim Report of the Working Group on Financial Markets* (May 1988) at 5.

<sup>172</sup> See *Interim Report* at 4.

<sup>173</sup> See *Interim Report* at Appendix A.



breaker rules for the securities and stock index futures markets were implemented in October 1988.<sup>174</sup>

The circuit breakers approved in 1988 provided for a one-hour trading halt in all securities markets if the DJIA declined 250 points from its previous day's closing level and for a subsequent two-hour trading halt if the DJIA declined 400 points from its previous day's close. In approving the original circuit breakers, the SEC and CFTC noted that the circuit breakers were not an attempt to prevent markets from reaching new price levels, but an effort by the securities and futures markets to arrive at a coordinated means to address potentially destabilizing market volatility along the lines of the historic decline of the October 1987 Market Break.<sup>175</sup> The SEC and CFTC also believed that circuit breakers would help promote stability in the equity and equity-related markets by providing for increased information flows and enhanced opportunity to assess information during times of extreme market movements. The SEC and CFTC believed that circuit breakers could provide market participants with an opportunity to re-establish an equilibrium between buying and selling interest and ensure that market participants had a reasonable opportunity to become aware of and respond to a dramatic market decline.<sup>176</sup>

#### a) Modifications to the Circuit Breakers from 1996 to 1998

The SEC and CFTC approved several modifications to the markets' circuit breaker rules starting in 1996. In July 1996, the agencies approved rule modifications to reduce the length of the trading halts by half. In addition, when the SEC and CFTC approved a six-month extension of the circuit breakers in October 1996,<sup>177</sup> the agencies urged the markets to reach a consensus on the size of increases in the trigger levels required to ensure that cross-market trading halts would be imposed only during market declines of historic proportions.<sup>178</sup> In response to the agencies' recommendations, the markets submitted proposals to increase the circuit breaker triggers to levels of 350 and 550 points in the DJIA.<sup>179</sup> In approving the 350/550 trigger levels through January 31, 1998, the agencies stated that the new trigger levels represented a substantial improvement over the existing 250/400 trigger levels. Nevertheless, the agencies noted

<sup>174</sup> See Securities Exchange Act Release Nos. 26198 (Oct. 19, 1988), 53 FR 41637 (October 24, 1988) (Amex, CBOE, NASD, and NYSE) ("1988 Approval Order"); 26218 (October 26, 1988), 53 FR 44137 (Nov. 1, 1988) (CHX); 26357 (December 14, 1988), 53 FR 51182 (December 20, 1988) (BSE); 26368 (December 16, 1988), 53 FR 51942 (Dec. 23, 1988) (PSE); 26386 (December 22, 1988), 53 FR 52904 (December 29, 1988) (PHLX); and 26440 (January 10, 1989), 54 FR 1830 (January 17, 1989) (CSE).

<sup>175</sup> Id.

<sup>176</sup> Id.

<sup>177</sup> See Securities Exchange Act Release No. 37890 (October 29, 1996), 61 FR 56983 (November 5, 1996) (Amex, NYSE, and PHLX).

<sup>178</sup> Id.

<sup>179</sup> See Securities Exchange Act Release No. 38221 (January 31, 1997) 62 FR 5871 (NYSE, Amex, CBOE, CHX, BSE, and PHLX) ("1997 Approval Order").

that trigger levels should be amended to reflect an extraordinary decline under prevailing market conditions and that the SEC and CFTC would work with the markets to develop procedures for reevaluating the circuit breaker triggers on at least an annual basis.<sup>180</sup>

On October 27, 1997, the nation's securities markets fell by a then-record absolute amount, with the DJIA declining 554.26 points (7.18 percent) to close at 7161.15. This was first and only day that the cross-market trading halt circuit breaker procedures were implemented. At 2:36 p.m., the DJIA had declined 350 points, thereby triggering a 30-minute halt on the stock, options, and index futures markets. After trading resumed at 3:06 p.m., prices fell rapidly to reach the 550-point circuit breaker level at 3:30 p.m., thereby ending the trading session 30 minutes prior to the normal stock market close.

Immediately following the events of October 27, the markets and regulators began considering further revisions to the circuit breaker procedures. There was general consensus that the 7 percent decline in the DJIA on October 27 did not justify the early closure of the markets on that day. Accordingly, an agreement was reached by the markets and the agencies that trigger points for circuit breaker halts should be increased substantially and measures should be taken to permit normal market closings if circuit breaker thresholds were reached late in a trading session.

Accordingly, the SEC and the CFTC approved revised circuit breaker rules for the markets in April 1998.<sup>181</sup> The revised rules established trading halts following one-day declines in the DJIA of 10 percent, 20 percent, and 30 percent. The NYSE would calculate the trigger levels at the beginning of each calendar quarter, using the average closing value of the DJIA for the previous month to establish specific point values for the quarter. Trading would halt for one hour if the DJIA declined 10 percent prior to 2:00 p.m., and for one-half hour if the DJIA declined 10 percent between 2:00 p.m. and 2:30 p.m. If the DJIA declined by 10 percent at or after 2:30 p.m., trading would not halt at the 10 percent level. If the DJIA declined 20 percent prior to 1:00 p.m., trading would halt for two hours; trading would halt for one hour if the DJIA declined 20 percent between 1:00 p.m. and 2:00 p.m., and trading would halt for the remainder of the day if a 20 percent decline occurred at or after 2:00 p.m. If the DJIA declined 30 percent at any time, trading would halt for the remainder of the day.

These were the circuit breaker levels in place on May 6, 2010.<sup>182</sup>

<sup>180</sup> Id.

<sup>181</sup> See Securities Exchange Act Release No. 39846 (April 9, 1998), 63 FR 18477 (April 15, 1998) (NYSE, Amex, BSE, CHX, NASD, and PHLX) ("April 1998 Approval Order").

<sup>182</sup> In November, 2002, trading in security futures products (SFPs) began. Any NYSE-declared circuit breaker trading halts would apply also to DCMs that trade SFPs including single security and narrow-based security index futures.

## 2. CME Price Limit “Speed Bumps”

In response to the historic market volatility in October 1987, the CME adopted downside intra-day price limits for index futures even before the cross-market circuit breaker trading halts were established. The CME’s 1988 price limits were set at 5 percent, 10 percent, and 15 percent, as well as a daily limit at 20 percent. These were not coordinated with the circuit breakers or any stock exchange rules and were based on the price of the index futures contract from the previous day’s settlement price. For each of the intra-day price limits, trading would be subject to the price limit for 10 minutes after a “locked limit” finding by exchange officials. If the futures contract were limit offered at the end of that 10-minute period, then trading would halt for two minutes, after which the next price limit would be in effect. The daily price limit of 20 percent would remain in effect for the remainder of the trading session.

The futures price limits also have changed since their adoption in 1988. The CME eliminated the 5 percent and 15 percent intra-day price limits effective on January 1, 2008 in order to harmonize rules across CME and CBOT contracts. The CME and ICE 10 percent and 20 percent intra-day price limits act as “speed bumps” – once a stock index futures contract is determined to be locked limit, the limit remains in effect and/or halts for a period of time determined by the exchange, after which, the next price limit becomes effective. The daily price limit of 20% was replaced by a new limit of 30%.

The CME also currently maintains a 5% price limit above or below the regular trading hour closing level applicable to overnight electronic trading only. No trading may occur at a price more than 5% above or below the regular trading hours closing level. If the price limit is bid or offered at the limit within five minutes prior to the opening of regular trading hours, then trading will be halted for the remainder of electronic trading hours until the commencement of regular trading hours at 9:30 a.m. During the trading halt, the CME will provide an indicative opening price for the re-opening of regular trading hours.

These were the index futures price limits in place on May 6, 2010.

A review of the history of price limit declarations shows that the 5 percent price limit was hit for the S&P 500 and E-mini S&P 500 futures contracts only 5 times since 1988.<sup>183</sup> At no time during that period were any higher level price limits hit. However, over the period 1998 through 2007, when the 5 percent price limit was in effect, there was a total of six days when the E-mini S&P 500 futures contract fell by 5% or more during the trading day. This discrepancy could be explained by method used to calculate the 5 percent price limit, which is reset each calendar quarter based on the average settlement price over the prior calendar month. After the CME eliminated the 5 percent limit, the E-mini S&P 500 fell by more than 5% on 21 days.

<sup>183</sup> The S&P 500 5 percent price limit was hit on October 8, 1988, October 13, 1989, October 27, 1997, April 4, 2000, and April 14, 2000.

## **APPENDIX D**

### **Futures Market Information**

- A. Most Active U.S. Stock Index Futures
- B. List of Active Designated Contract Markets
- C. Detailed Trading Statistics for the E-mini S&P 500 June 2010 futures on May 6, 2010. Volume, Price, Account, User Summary by hour, minute and second

**A. MOST ACTIVE U.S. STOCK INDEX FUTURES**

	Name	Multiplier	Index Close 5/5/10	Notional Value at close	Open Interest as of close on 5/5/10	Notional Futures on Close on 5/5/10	Market Share of US Stock Index Futures (Notional Futures)	Volume on 5/5/10 (30-day avg vol.)
1	CME E-MINI S&P 500	\$50 x Index	1,128	\$56,400	2,719,296	\$152,482,722,429	48.97%	5,682,565 (2,482,578)
2	CME S&P 500 STOCK INDEX	\$250 x Index	1,128	\$281,250	333,153	\$95,546,157,913	30.69%	54,701 (72,622)
3	ICE US RUSSELL 2000 MINI INDEX FUTURE	\$100 x Index	672	\$67,200	399,159	\$27,419,678,895	8.81%	392,565 (171,686)
4	CME NASDAQ-100 STOCK INDEX (MINI)	\$70 x Index	1,893	\$177,900	381,569	\$15,439,890,478	4.96%	738,784 (1,339,914)
5	CME NASDAQ-100 STOCK INDEX	\$100 x Index	1,893	\$189,300	26,667	\$4,882,124,351	1.57%	4,302 (1,823)
6	CME E-MINI S&P 400 STOCK INDEX	\$100 x Index	776	\$77,600	97,067	\$7,841,925,515	2.52%	56,654 (129,161)
7	CME S&P 400 MIDCAP STOCK IDX	\$500 x Index	776	\$388,000	1,788	\$720,427,400	0.23%	115 (61)
8	CBT DOW JONES INDUSTRIAL AVG x \$5	\$5 x Index	10,520	\$52,600	84,706	\$4,457,248,441	1.46%	526,704 (145,345)

9	CBT DOW JONES INDUSTRIAL AVG x \$10	\$10 x Index	10,520	\$105,200	11,045	\$1,190,212,740	0.38%	894 (720)
10	CBT DOW JONES INDUSTRIAL AVG x \$25	\$25 x Index	10,520	\$263,000	28	\$7,311,500	0.00%	10 (5)
11	ICUS RUSSEL 1000 MINI INDEX FUTURE	\$100 x Index	621	\$62,100	19,589	\$1,250,936,760	0.40%	1842 (918)
12	CME E-MINI S&P SMALLCAP 600 INDEX	\$100 x Index	340	\$36,000	689	\$21,348,000	0.01%	392 (141)

## **B. DCMS WITH CONTRACTS THAT ACTIVELY TRADE**

1. **CBOE Futures Exchange**. An electronic exchange operating in Chicago, IL; CBOE Futures lists contracts on various volatility measures; CBOE Futures is a subsidiary of the Chicago Board of Options Exchange (designated on August 7, 2003).
2. **CBOT**. CBOT (Board of Trade of the City of Chicago, Inc.) is located in Chicago, IL; Trading takes place both electronically on CME Globex and on trading floors; CBOT listed contracts include agricultural, indexes, interest rates, and treasuries; originally organized as a grain cash market in 1848, and became a subsidiary of the CME Group, Inc. in 2007.
3. **CCFE**. An electronic exchange located in Chicago, IL; CCFE (Chicago Climate Futures Exchange, LLC) is a wholly owned subsidiary of the Chicago Climate Exchange Inc. (CCX); CCFE listed contracts include emissions contracts (designated November 9, 2004).
4. **CME**. CME (Chicago Mercantile Exchange Inc.) is located in Chicago, IL; trading takes place both electronically on CME Globex and on trading floors; CME listed contracts include agricultural, weather, FX, indexes, and real estate; began operation in 1898; the parent of CME (CME Group, Inc.) purchased CBOT in 2007.
5. **COMEX**. COMEX (The Commodity Exchange, Inc) is located in New York, NY; trading take place electronically on CME Globex and on trading floors in New York; COMEX lists contracts on precious metals; COMEX became a subsidiary of the New York Mercantile Exchange in 1994.
6. **ELX**. An electronic exchange located in New York, NY; ELX (ELX Futures, L.P.) was founded by a consortium of dealers, trading firms, and technology providers, including a number of large commercial and investment banks; ELX currently lists only treasury contracts. (designated May 22, 2009).
7. **ICE US**. ICE U.S. (ICE Futures US, Inc) is located in New York, NY; trading takes place both electronically on the ICE Trading system and on trading floors in New York; ICE US listed contracts include currencies, iron ore, agricultural products, and the Russell 1000 stock index. NYBOT was created by the merger of the Coffee, Sugar and Cocoa Exchange and the New York Cotton Exchange in 2004; NYBOT changed its name to ICE Futures US, Inc. after it became a wholly-owned subsidiary of the IntercontinentalExchange in 2007.
8. **KCBT**. KCBT (Kansas City Board of Trade) is located in Kansas City, KS; trading takes place both electronically on CME Globex and on trading floors in Kansas City; listed contracts include wheat and a broad-based stock index; KCBT futures trading in grains began in 1876.
9. **MGEX**. MGEX (Minneapolis Grain Exchange) is located in Minneapolis, MN; trading takes place both electronically on CME Globex and on trading floors; listed contracts

include wheat and agricultural indexes; MGEX was started in 1881 and renamed MGEX in 1947.

10. **NFX**. NFX (NASDAQ OMX Futures Exchange) is an electronic exchange in New York, NY; primarily lists currency and currency-related contracts. NFX was started as Philadelphia Board of Trade; its parent (then PHLX) was bought by NASDAQ OMX in 2008.
11. **NYMEX**. NYMEX (New York Mercantile Exchange) is located in New York, NY; trading takes place both electronically on CME Globex and on trading floors in New York; listed contracts include energy-related and, emissions. NYMEX was originally founded in 1872 as the Butter and Cheese Exchange of New York (which became NYMEX in 1882) and became a wholly-owned subsidiary of CME Group Inc. in 2008.
12. **NADEX**. NADEX (North American Derivatives Exchange, Inc.) is a Chicago-based, electronic exchange offering retail-oriented, binary and variable payout options on stock indices, foreign exchange rates, economic events, metals, and certain agricultural commodities (designated February 18, 2004).
13. **NYSE Liffe**. NYSE Liffe (NYSE Liffe U.S. LLC) is an electronic exchange located in New York, NY; listed contracts include precious metals and equity indexes; NYSE Liffe was launched in 2008 as a subsidiary of NYSE Euronext (designated August 21, 2008).
14. **OneChicago**. OneChicago (OneChicago LLC Futures Exchange; also called OCX) is an electronic exchange located in Chicago, IL; listed contracts include individual stocks, narrow-based indexes, and exchange traded funds. OneChicago is owned by a consortium that includes Interactive Brokers Group, LLC, the CME Group, Inc., and the CBOE (designated June 11, 2002).



### **C. Detailed Trading Statistics for the e-Mini S&P 500 June 2010 futures**

This section contains detailed trading data for the CME e-mini S&P 500 June 2010 futures contract covering the following three time periods (all times Eastern Daylight Time):

- Activity by hour from May 5 4:00 PM through May 6 5:00 PM
- Activity by minute from May 6 1:00 PM through May 6 4:15 PM
- Activity by second from May 6 2:41:00 PM through May 6 2:50:00 PM

For each time slice, the following information is displayed:

- The number of trades (Trades)
- The number of individual contracts traded (Volume)
- The price of the first trade (First)
- The highest trade price (High)
- The lowest trade price (Low)
- The price of the last trade (Last)
- The difference between the last price and the first price (Last – First Range)
- The difference between the highest price and the lowest price (High/Low Range)
- The volume weighted average price (VWAP)
- The number of unique Globex accounts executing buys (Buy Accts)
- The number of unique Globex accounts executing sells (Sell Accts)
- The number of unique parties executing buys (Buy User IDs)<sup>184</sup>
- The number of unique parties executing sells (Sell User IDs)
- A graphical display of the volume (Volume Graph)

As can be seen in the tables, the number of User IDs is normally greater than the number of Accounts. This can be due to the use of a single account by multiple User IDs. For example, there is not a specific limit to the number of automated trading systems (ATS) that an individual can use to trade his personal account. Each ATS would be given a unique User ID.

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<sup>184</sup> CME Group Rule 576 requires that each order entered into CME Globex include the submission of an operator ID, also referred to as the “Tag 50 ID” or “User ID”, which is unique to the party who entered the order. For orders entered manually, the Tag 50 ID must be unique to the individual entering the order into CME Globex. For orders entered by an automated trading system (“ATS”), the Tag 50 ID must be unique to the person, or the identified team of persons on the same shift, who are responsible for the operation of the ATS. All Tag 50 IDs must be unique at the level of the clearing member firm. See Market Regulation Advisory Notice RA0915-5, “Operator ID (‘Tag 50’) Required on All CME Globex Orders,” available from CME Group at [http://www.cmegroup.com/rulebook/files/CME\\_Group\\_RA0915-5.pdf](http://www.cmegroup.com/rulebook/files/CME_Group_RA0915-5.pdf) (visited May 15, 2010).

The numbers for Buy Accts and Sell Accts provide a rough idea of the breadth of participation from an account owner/controller standpoint. The numbers for Buy User IDs and Sell User IDs provide a rough idea of the breadth of participation from the standpoint of users directly interfacing with the Globex system. Many participants were both buyers and sellers and they would be included in both the Buy and Sell columns.

Source of data: CME Group as of May 13, 2010

**CME E-Mini SP Futures  
June 2010 Contract  
Summarized Activity By Hour (Eastern Daylight Time)  
Trade Date May 6, 2010**

Row	Date	Time (EST)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User Ids	Sell User Ids	Volume	Graph
1	5/5/2010	4 PM	792	5,817	1163.75	1164.25	1163.50	1163.75	0.00	0.75	1163.890	151	157	290	162	5,817	
2		5 PM	749	4,808	1163.50	1165.00	1163.00	1164.50	1.00	2.00	1163.867	143	166	251	171	4,808	
3		6 PM	1,117	5,053	1164.75	1166.25	1164.50	1166.25	1.50	1.75	1165.403	203	264	223	281	5,053	
4		7 PM	1,453	5,368	1166.25	1167.00	1165.00	1166.50	0.25	2.00	1166.108	203	278	218	253	5,368	
5		8 PM	2,988	9,572	1166.50	1167.00	1164.50	1166.25	-0.25	2.50	1165.952	254	266	301	285	9,572	
6		9 PM	1,513	4,312	1166.50	1167.00	1165.75	1166.75	0.25	1.25	1166.451	172	184	183	206	4,312	
7		10 PM	1,690	5,196	1167.00	1167.25	1165.50	1166.75	-0.25	1.75	1166.492	218	209	238	228	5,196	
8		11 PM	1,370	3,430	1167.00	1167.00	1165.50	1165.75	-1.25	1.50	1166.247	161	128	179	141	3,430	
9		12 AM	1,813	6,008	1165.75	1166.00	1164.00	1164.75	-1.00	2.00	1164.717	269	199	313	223	6,008	
10	5/6/2010	1 AM	1,221	4,890	1164.75	1165.00	1164.00	1164.25	-0.50	1.00	1164.328	151	154	165	160	4,890	
11		2 AM	7,204	34,675	1164.25	1165.25	1159.25	1159.50	-4.75	6.00	1162.248	592	583	656	635	34,675	
12		3 AM	24,652	71,899	1159.75	1166.50	1158.00	1165.25	5.50	8.50	1161.506	785	769	937	913	71,899	
13		4 AM	14,339	43,310	1165.25	1167.25	1163.00	1167.50	2.25	4.75	1165.649	589	584	700	691	43,310	
14		5 AM	9,014	30,262	1167.25	1168.00	1164.75	1166.50	-0.75	3.25	1166.422	433	467	507	554	30,262	
15		6 AM	7,953	30,743	1166.75	1168.75	1166.75	1168.50	1.75	2.00	1168.051	433	559	493	636	30,743	
16		7 AM	19,841	64,871	1168.25	1168.75	1162.25	1163.00	-5.25	6.50	1165.817	859	783	1,009	940	64,871	
17		8 AM	34,226	152,841	1163.00	1165.00	1155.50	1156.00	-7.00	9.50	1160.594	2,086	1,728	2,413	1,971	152,841	
18		9 AM	93,015	398,117	1156.25	1164.50	1155.25	1161.75	5.50	9.25	1159.933	4,325	4,200	4,993	4,755	398,117	
19		10 AM	113,467	524,215	1161.50	1165.00	1153.25	1155.50	-6.00	11.75	1158.877	4,849	4,843	5,661	5,504	524,215	
20		11 AM	122,268	618,337	1155.50	1155.50	1147.25	1151.75	-3.75	8.25	1151.099	5,548	4,804	6,252	5,377	618,337	
21		12 PM	73,439	347,471	1152.00	1157.25	1148.50	1152.00	0.00	8.75	1153.052	3,498	2,681	3,888	4,124	347,471	
22		1 PM	83,577	414,013	1152.25	1153.50	1140.75	1142.25	-10.00	12.75	1145.918	4,368	3,866	4,690	4,271	414,013	
23		2 PM	290,556	1,600,843	1142.25	1143.75	1056.00	1112.75	-29.50	87.75	1113.142	6,929	6,873	7,669	7,564	1,600,843	
24		3 PM	247,380	1,109,014	1112.75	1136.00	1103.25	1123.00	10.25	32.75	1122.277	4,795	5,215	5,214	5,698	1,109,014	
25		4 PM	30,105	177,523	1123.50	1125.00	1119.50	1122.75	-0.75	5.50	1122.310	1,609	1,330	1,727	1,429	177,523	

**CME E-Mini SP Futures**  
**June 2010 Contract**  
**Summarized Activity By Minute 1:00 PM-3:15 PM (Eastern Daylight Time)**  
**Trade Date May 6, 2010**

Row	Time [DD]	Trades	Volume	First	High	Low	Last	Last - First	High / Low	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume	Graph
1	1:00 PM	2,211	9,653	1152.25	1153.50	1151.75	1153.00	0.75	1.75	1152.724	233	405	284	452	9,653	
2	1:01 PM	774	3,089	1153.00	1153.25	1152.25	1152.25	-0.75	1.00	1152.812	134	138	151	166	3,089	
3	1:02 PM	1,140	5,034	1152.25	1152.75	1151.25	1152.00	-0.25	1.50	1151.966	201	183	252	205	5,034	
4	1:03 PM	544	1,885	1152.25	1152.25	1151.25	1151.25	-1.00	1.00	1151.579	121	79	139	97	1,885	
5	1:04 PM	629	2,732	1151.25	1152.50	1151.25	1152.25	1.00	1.25	1152.094	76	135	95	190	2,732	
6	1:05 PM	879	3,112	1152.25	1152.75	1151.75	1152.50	0.25	1.00	1152.367	125	182	148	189	3,112	
7	1:06 PM	854	3,334	1152.25	1152.75	1151.50	1151.75	-0.50	1.25	1151.850	118	111	150	132	3,334	
8	1:07 PM	1,484	4,860	1151.75	1151.75	1150.25	1150.50	-1.25	1.50	1150.854	204	202	242	243	4,860	
9	1:08 PM	1,234	4,996	1150.25	1151.00	1150.00	1150.50	0.25	1.00	1150.424	181	164	220	191	4,996	
10	1:09 PM	520	2,237	1150.75	1151.50	1150.50	1151.25	0.50	1.00	1150.867	84	118	97	138	2,237	
11	1:10 PM	581	2,516	1151.25	1151.75	1150.50	1151.00	-0.25	1.25	1151.250	109	120	135	138	2,516	
12	1:11 PM	2,143	9,643	1151.00	1151.00	1148.75	1149.25	-1.75	2.25	1149.609	315	256	271	273	9,643	
13	1:12 PM	1,418	8,563	1149.25	1149.25	1148.25	1148.50	-0.75	1.00	1148.767	246	192	297	220	8,563	
14	1:13 PM	1,720	8,078	1148.25	1149.00	1147.75	1148.50	0.25	1.25	1148.308	322	228	369	265	8,078	
15	1:14 PM	1,696	8,144	1148.50	1149.00	1147.25	1147.50	-1.00	1.75	1148.174	321	198	426	231	8,144	
16	1:15 PM	1,963	9,130	1147.50	1148.50	1147.25	1147.50	0.00	1.25	1148.000	259	209	307	254	9,130	
17	1:16 PM	2,625	13,845	1147.75	1148.50	1146.75	1147.25	-0.50	1.75	1147.400	410	355	483	399	13,845	
18	1:17 PM	3,259	18,800	1147.25	1147.50	1145.50	1146.50	-0.75	2.00	1146.316	600	454	694	510	18,800	
19	1:18 PM	1,434	8,070	1146.50	1147.25	1146.25	1146.50	0.00	1.00	1146.730	270	195	311	230	8,070	
20	1:19 PM	1,253	5,010	1146.50	1147.50	1145.50	1147.00	0.50	1.00	1147.051	185	211	212	238	5,010	
21	1:20 PM	1,877	8,456	1147.25	1147.50	1146.25	1146.25	-1.00	1.25	1147.037	358	193	301	221	8,456	
22	1:21 PM	1,197	5,020	1146.25	1147.25	1146.00	1146.50	0.25	1.25	1146.604	185	156	219	189	5,020	
23	1:22 PM	504	2,009	1146.75	1146.75	1146.00	1146.25	-0.50	0.75	1146.411	118	90	131	104	2,009	
24	1:23 PM	1,913	12,084	1146.25	1146.50	1145.25	1145.25	-1.00	1.25	1145.789	337	243	407	280	12,084	
25	1:24 PM	3,181	18,284	1145.25	1145.50	1144.50	1145.00	-0.25	1.00	1145.001	598	411	691	472	18,284	
26	1:25 PM	2,087	9,681	1144.75	1145.75	1144.25	1145.50	0.75	1.50	1144.870	406	369	477	293	9,681	
27	1:26 PM	2,007	9,837	1145.75	1146.25	1145.25	1146.25	0.50	1.00	1145.776	266	250	323	305	9,837	
28	1:27 PM	1,033	6,052	1146.25	1146.50	1145.75	1146.25	0.00	0.75	1146.204	173	162	193	216	6,052	
29	1:28 PM	1,530	5,544	1146.00	1146.50	1145.50	1146.25	0.25	1.00	1145.966	153	191	188	227	5,544	
30	1:29 PM	1,095	4,838	1146.25	1147.50	1146.25	1147.50	1.25	1.25	1146.895	203	280	227	316	4,838	
31	1:30 PM	817	3,254	1147.25	1147.50	1146.75	1146.75	-0.50	0.75	1147.213	182	192	192	226	3,254	
32	1:31 PM	735	2,374	1147.00	1147.00	1146.50	1147.00	0.00	0.50	1146.812	139	142	164	160	2,374	
33	1:32 PM	744	3,221	1147.00	1147.25	1146.50	1146.75	-0.25	0.75	1146.994	127	129	149	153	3,221	
34	1:33 PM	1,061	3,608	1146.75	1146.75	1145.75	1146.00	-0.75	1.00	1146.203	185	171	215	202	3,608	
35	1:34 PM	773	2,427	1146.00	1146.50	1145.50	1146.25	0.25	1.00	1145.975	128	142	149	158	2,427	
36	1:35 PM	664	2,514	1146.25	1146.50	1145.75	1146.25	0.00	0.75	1146.095	138	91	158	108	2,514	
37	1:36 PM	1,564	9,536	1146.25	1146.50	1144.75	1144.75	-1.50	1.75	1145.268	305	236	349	271	9,536	
38	1:37 PM	1,768	7,963	1144.75	1145.75	1144.25	1145.00	0.25	1.50	1144.912	297	212	335	242	7,963	
39	1:38 PM	1,847	10,833	1143.00	1145.00	1143.75	1144.00	-1.00	1.25	1144.256	366	329	418	375	10,833	
40	1:39 PM	1,217	6,900	1144.00	1145.00	1143.75	1144.25	0.25	1.25	1144.605	286	194	273	232	6,900	
41	1:40 PM	3,003	19,136	1144.50	1144.50	1142.75	1143.00	-1.50	1.75	1143.368	677	430	650	477	19,136	
42	1:41 PM	2,357	13,605	1143.00	1144.00	1142.50	1143.75	0.75	1.50	1143.173	351	342	398	393	13,605	
43	1:42 PM	963	4,703	1143.75	1144.00	1143.50	1143.75	0.00	0.50	1143.834	178	181	201	181	4,703	
44	1:43 PM	859	4,315	1144.00	1144.50	1143.75	1144.00	0.00	0.75	1144.211	186	185	208	211	4,315	
45	1:44 PM	1,184	5,763	1144.25	1144.75	1144.00	1144.50	0.25	0.75	1144.386	203	150	233	185	5,763	
46	1:45 PM	893	5,790	1144.50	1145.00	1144.25	1145.00	0.50	0.75	1144.828	205	186	228	207	5,790	
47	1:46 PM	1,116	7,157	1145.00	1145.25	1144.25	1145.00	0.00	1.00	1144.827	221	184	252	220	7,157	
48	1:47 PM	874	4,457	1145.00	1145.50	1144.50	1145.25	0.25	1.00	1144.979	142	208	169	232	4,457	
49	1:48 PM	919	3,922	1145.50	1145.75	1144.25	1144.50	-1.00	1.50	1145.047	204	196	229	220	3,922	
50	1:49 PM	955	4,795	1144.25	1145.00	1144.00	1144.25	0.00	1.00	1144.502	138	159	157	186	4,795	

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
51	1:50 PM	859	3,530	1144.50	1144.50	1143.75	1144.25	-0.25	0.75	1144.146	132	178	108	199	3,530
52	1:51 PM	535	1,991	1144.25	1144.75	1144.00	1144.75	0.50	0.75	1144.488	121	106	142	124	1,991
53	1:52 PM	559	2,437	1144.50	1144.75	1144.25	1144.25	-0.25	0.50	1144.449	147	85	159	95	2,437
54	1:53 PM	1,262	5,103	1144.25	1145.00	1144.00	1144.50	0.25	1.00	1144.484	196	151	230	170	5,103
55	1:54 PM	1,273	5,363	1144.25	1144.25	1143.50	1143.75	-0.50	0.75	1143.856	226	225	266	263	5,363
56	1:55 PM	1,286	6,229	1143.75	1144.00	1142.75	1143.00	-0.75	1.25	1143.290	242	246	278	283	6,229
57	1:56 PM	3,607	22,058	1143.00	1143.25	1140.75	1141.25	-1.75	2.50	1141.612	713	521	817	572	22,058
58	1:57 PM	2,329	11,814	1141.00	1143.00	1141.00	1143.00	2.00	2.00	1142.141	289	333	329	376	11,814
59	1:58 PM	1,639	8,610	1142.75	1143.75	1142.50	1142.75	0.00	1.25	1143.179	271	279	302	327	8,610
60	1:59 PM	1,150	6,069	1142.75	1142.75	1141.75	1142.25	-0.50	1.00	1142.221	231	186	270	214	6,069
61	2:00 PM	1,522	8,523	1142.25	1143.50	1142.00	1143.25	1.00	1.50	1142.869	207	260	254	292	8,523
62	2:01 PM	1,173	6,806	1143.25	1143.75	1142.50	1143.25	0.00	1.25	1143.237	168	212	194	240	6,806
63	2:02 PM	1,314	6,373	1143.25	1143.50	1142.25	1142.50	-0.75	1.25	1142.872	164	184	198	224	6,373
64	2:03 PM	1,467	6,691	1142.75	1142.75	1141.50	1142.00	-0.75	1.25	1142.066	245	240	289	275	6,691
65	2:04 PM	2,844	13,478	1141.75	1142.25	1140.25	1141.00	-0.75	2.00	1141.183	418	339	479	388	13,478
66	2:05 PM	1,899	9,946	1141.00	1141.75	1140.75	1141.00	0.00	1.00	1141.048	323	202	373	232	9,946
67	2:06 PM	3,230	23,234	1141.00	1141.25	1139.00	1139.25	-1.75	2.25	1139.933	678	452	753	502	23,234
68	2:07 PM	2,458	14,620	1139.00	1140.50	1138.75	1140.50	1.50	1.75	1139.477	398	385	456	429	14,620
69	2:08 PM	2,550	15,361	1140.25	1140.50	1138.25	1138.25	-2.00	2.25	1139.106	435	304	506	351	15,361
70	2:09 PM	3,751	21,942	1138.25	1138.25	1137.25	1137.75	-0.50	1.25	1137.833	662	489	769	546	21,942
71	2:10 PM	3,369	22,577	1137.50	1138.25	1136.00	1136.25	-1.25	2.25	1137.251	383	437	651	486	22,577
72	2:11 PM	7,309	37,762	1136.25	1137.25	1135.00	1134.00	-2.25	3.75	1135.314	807	654	930	728	37,762
73	2:12 PM	4,419	22,212	1134.00	1136.75	1134.00	1136.50	2.50	2.75	1135.512	500	439	557	498	22,212
74	2:13 PM	3,181	15,895	1136.50	1138.00	1136.00	1137.50	1.00	2.00	1137.258	362	475	406	534	15,895
75	2:14 PM	1,929	8,471	1137.50	1137.75	1136.50	1137.00	-0.50	1.25	1137.171	214	274	244	307	8,471
76	2:15 PM	2,227	11,221	1137.00	1138.00	1136.75	1137.00	0.00	1.25	1137.493	312	276	352	319	11,221
77	2:16 PM	1,989	9,677	1137.25	1137.50	1135.50	1135.50	-1.75	2.00	1136.792	271	242	315	279	9,677
78	2:17 PM	3,466	15,947	1135.50	1135.75	1133.25	1133.50	-2.00	2.50	1134.799	481	383	561	442	15,947
79	2:18 PM	5,353	27,127	1133.50	1133.75	1131.00	1133.75	0.25	2.75	1132.452	665	628	768	693	27,127
80	2:19 PM	2,289	13,431	1133.75	1134.25	1131.50	1131.75	-2.00	2.75	1132.789	378	305	424	362	13,431
81	2:20 PM	6,930	37,893	1131.75	1132.00	1128.25	1128.50	-3.25	3.75	1130.122	753	715	863	792	37,893
82	2:21 PM	6,519	30,954	1128.25	1129.50	1125.75	1125.75	-2.50	3.75	1127.951	776	639	880	740	30,954
83	2:22 PM	5,868	29,438	1126.00	1129.00	1124.75	1129.00	3.00	4.25	1127.144	578	545	673	633	29,438
84	2:23 PM	3,064	13,631	1128.75	1130.00	1128.25	1129.50	0.75	1.75	1129.132	348	422	385	476	13,631
85	2:24 PM	4,590	27,243	1129.50	1132.50	1129.25	1132.25	2.75	3.25	1130.790	438	512	493	585	27,243
86	2:25 PM	2,716	12,503	1132.25	1132.75	1131.00	1132.75	0.50	1.75	1131.976	351	431	380	485	12,503
87	2:26 PM	3,341	18,074	1132.50	1133.75	1132.25	1133.25	0.75	1.50	1133.216	462	481	462	527	18,074
88	2:27 PM	3,109	16,079	1133.25	1133.50	1131.25	1132.25	-1.00	2.25	1132.473	361	358	340	413	16,079
89	2:28 PM	3,012	14,046	1132.25	1132.50	1130.00	1130.25	-2.00	2.50	1131.065	356	358	409	410	14,046
90	2:29 PM	2,684	12,150	1130.25	1131.25	1129.50	1130.25	0.00	1.75	1130.290	336	292	365	345	12,150
91	2:30 PM	2,768	12,878	1130.25	1131.00	1128.00	1128.75	-1.50	3.00	1129.476	391	329	448	381	12,878
92	2:31 PM	2,931	13,014	1128.75	1130.00	1127.25	1127.75	-1.00	2.75	1128.652	370	319	424	337	13,014
93	2:32 PM	2,233	10,135	1127.50	1128.00	1126.25	1126.50	-1.00	1.75	1127.072	391	279	445	303	10,135
94	2:33 PM	3,081	14,914	1126.75	1128.50	1126.25	1127.75	1.00	2.25	1127.612	380	262	435	304	14,914
95	2:34 PM	3,418	22,939	1127.50	1128.00	1125.75	1126.00	-1.50	2.25	1127.055	378	301	434	348	22,939
96	2:35 PM	6,431	31,297	1126.00	1126.00	1122.50	1124.50	-1.50	3.50	1124.045	788	631	898	717	31,297
97	2:36 PM	5,149	25,391	1124.50	1124.50	1120.00	1120.00	-4.50	4.50	1122.544	659	539	729	606	25,391
98	2:37 PM	5,923	32,938	1120.00	1121.50	1119.50	1121.25	1.25	2.00	1120.354	720	536	814	607	32,938
99	2:38 PM	6,094	29,242	1121.25	1123.50	1121.00	1121.00	-0.25	2.50	1122.423	562	510	644	589	29,242
100	2:39 PM	8,441	42,855	1121.25	1121.25	1113.50	1114.00	-7.25	7.75	1116.926	836	839	953	958	42,855

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	First Range	High Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
101	2:40 PM	7,100	37,916	1114.00	1114.25	1111.25	1113.00	-1.00	3.00	1113.050	783	590	899	659	37,916
102	2:41 PM	5,644	30,279	1113.25	1115.75	1113.00	1114.00	0.75	2.75	1114.355	630	540	719	624	30,279
103	2:42 PM	7,497	38,943	1114.00	1114.25	1106.50	1107.00	-7.00	7.75	1111.189	690	739	789	831	38,943
104	2:43 PM	13,383	73,083	1107.00	1107.25	1098.00	1098.75	-8.25	9.25	1101.573	974	914	1104	1032	73,083
105	2:44 PM	14,388	67,432	1098.50	1098.75	1080.50	1082.00	-16.50	18.25	1092.413	838	992	958	1131	67,432
106	2:45 PM	14,645	78,412	1081.50	1082.00	1056.00	1089.00	-12.50	26.00	1065.028	836	822	1115	1010	78,412
107	2:46 PM	7,800	55,833	1068.75	1077.75	1061.00	1072.50	3.75	16.75	1070.273	796	595	823	651	55,833
108	2:47 PM	5,939	44,721	1072.75	1088.25	1070.75	1086.00	13.25	17.50	1076.332	646	573	712	621	44,721
109	2:48 PM	7,818	54,995	1085.75	1097.00	1082.00	1090.50	4.75	15.00	1091.335	737	745	800	851	54,995
110	2:49 PM	5,494	42,133	1090.50	1093.25	1083.25	1088.75	-1.75	10.00	1088.248	538	514	591	545	42,133
111	2:50 PM	4,787	37,168	1085.00	1097.75	1084.75	1097.00	8.00	13.00	1090.106	541	524	590	559	37,168
112	2:51 PM	7,964	47,024	1097.00	1109.75	1094.25	1107.50	10.50	15.50	1101.499	744	787	836	865	47,024
113	2:52 PM	5,695	39,953	1107.25	1111.50	1102.25	1111.25	4.00	9.25	1105.792	579	740	650	825	39,953
114	2:53 PM	6,750	41,315	1111.50	1118.00	1109.50	1117.75	6.25	8.50	1113.585	634	810	685	909	41,315
115	2:54 PM	6,689	39,728	1118.00	1119.00	1107.50	1108.25	-8.75	11.50	1113.659	592	907	664	1006	39,728
116	2:55 PM	4,429	22,460	1109.25	1114.25	1107.75	1112.50	3.25	6.50	1110.954	521	452	579	496	22,460
117	2:56 PM	4,541	20,325	1112.50	1117.50	1112.50	1116.50	4.00	5.00	1115.534	421	508	472	538	20,325
118	2:57 PM	3,536	26,535	1116.50	1119.50	1115.75	1118.75	2.25	3.75	1118.314	456	567	513	609	26,535
119	2:58 PM	5,173	22,715	1118.75	1118.75	1113.75	1115.75	-3.00	5.00	1115.629	421	604	491	866	22,715
120	2:59 PM	4,643	20,765	1115.75	1116.00	1110.75	1112.75	-3.00	5.25	1113.017	397	488	459	544	20,765
121	3:00 PM	5,975	30,079	1112.75	1112.75	1103.25	1105.50	-7.25	9.50	1107.815	494	681	564	737	30,079
122	3:01 PM	4,811	20,309	1105.75	1115.25	1105.75	1113.00	7.25	9.50	1110.935	628	532	716	590	20,309
123	3:02 PM	4,111	20,445	1112.75	1116.50	1110.50	1116.50	3.75	6.00	1113.190	405	444	445	494	20,445
124	3:03 PM	5,457	23,106	1116.25	1121.00	1115.75	1120.00	3.75	5.25	1118.382	557	681	630	723	23,106
125	3:04 PM	4,856	22,346	1120.00	1121.25	1117.75	1119.00	-1.00	3.50	1119.233	426	515	484	581	22,346
126	3:05 PM	5,715	27,322	1118.75	1123.50	1116.75	1123.50	4.75	6.75	1119.836	496	578	560	631	27,322
127	3:06 PM	5,147	22,114	1123.75	1124.00	1120.25	1121.75	-2.00	3.75	1122.412	461	555	525	636	22,114
128	3:07 PM	4,109	24,415	1121.75	1126.50	1121.00	1126.00	4.25	5.50	1123.137	463	520	515	584	24,415
129	3:08 PM	6,410	27,632	1126.25	1131.25	1125.50	1131.00	4.75	5.75	1127.955	633	798	710	881	27,632
130	3:09 PM	6,749	28,343	1131.25	1131.75	1125.00	1126.25	-5.00	6.75	1128.235	569	762	628	861	28,343
131	3:10 PM	3,751	18,702	1126.50	1128.00	1125.75	1127.75	1.25	2.25	1126.762	382	374	423	422	18,702
132	3:11 PM	6,450	25,509	1128.00	1128.00	1117.50	1118.25	-9.75	10.50	1122.901	565	590	631	669	25,509
133	3:12 PM	4,867	16,313	1118.25	1122.25	1117.75	1120.25	2.00	4.50	1120.258	490	443	578	505	16,313
134	3:13 PM	3,372	11,372	1120.25	1122.50	1119.00	1121.25	1.00	3.50	1120.292	352	351	396	410	11,372
135	3:14 PM	2,170	8,121	1121.25	1121.75	1119.25	1119.75	-1.50	2.50	1120.707	229	267	260	287	8,121
136	3:15 PM	3,620	15,347	1119.75	1121.25	1118.00	1120.25	0.50	3.25	1119.750	363	388	417	437	15,347
137	3:16 PM	3,674	12,236	1120.25	1122.75	1120.25	1122.00	1.75	2.50	1121.620	393	304	386	347	12,236
138	3:17 PM	3,139	12,052	1121.75	1125.50	1121.00	1125.00	3.25	4.50	1123.507	386	334	438	393	12,052
139	3:18 PM	5,900	21,477	1125.00	1125.75	1118.50	1119.00	-6.00	7.25	1121.851	436	490	504	568	21,477
140	3:19 PM	4,962	20,821	1119.00	1119.00	1115.25	1115.75	-3.25	3.75	1117.026	482	482	547	552	20,821
141	3:20 PM	5,739	20,310	1115.75	1116.00	1111.75	1112.25	-3.50	4.25	1113.553	614	551	706	633	20,310
142	3:21 PM	6,334	23,136	1112.00	1113.50	1108.00	1113.25	1.25	5.50	1110.479	657	573	751	600	23,136
143	3:22 PM	3,632	13,831	1113.25	1116.75	1112.50	1114.75	1.50	4.25	1114.068	518	432	588	496	13,831
144	3:23 PM	3,861	14,472	1114.75	1115.50	1111.50	1112.50	-2.25	4.00	1113.478	381	397	404	451	14,472
145	3:24 PM	2,230	7,490	1112.50	1113.50	1111.75	1112.25	-0.25	1.75	1112.577	231	202	262	237	7,490
146	3:25 PM	3,979	14,881	1112.25	1112.25	1108.25	1108.50	-3.75	4.00	1110.268	436	425	485	486	14,881
147	3:26 PM	5,071	19,247	1108.25	1112.00	1106.50	1107.25	-1.00	5.50	1108.335	552	469	633	539	19,247
148	3:27 PM	3,514	11,622	1107.25	1111.25	1106.50	1110.00	2.75	4.75	1108.517	476	348	545	400	11,622
149	3:28 PM	2,230	8,758	1110.00	1111.00	1109.00	1110.50	0.50	2.00	1110.079	261	239	289	276	8,758
150	3:29 PM	4,647	16,857	1110.50	1118.00	1110.00	1117.50	7.00	8.00	1115.133	543	510	617	561	16,857

Now	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High / Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
151	3:30 PM	4,700	17,153	1117.75	1122.00	1116.50	1121.50	3.75	5.50	1118.999	489	638	519	663	17,153
152	3:31 PM	4,288	15,811	1121.50	1122.25	1118.25	1121.00	-0.50	4.00	1120.193	410	566	463	632	15,811
153	3:32 PM	2,877	11,096	1121.00	1121.25	1117.00	1119.25	-1.75	4.25	1119.014	329	363	367	421	11,096
154	3:33 PM	2,789	11,402	1119.50	1120.25	1118.00	1119.00	-0.50	2.25	1119.245	288	252	289	289	11,402
155	3:34 PM	2,523	10,495	1119.00	1122.50	1118.75	1122.00	3.00	3.75	1120.688	337	295	380	331	10,495
156	3:35 PM	4,281	16,895	1122.25	1126.25	1120.00	1125.50	3.25	6.25	1123.863	497	542	553	606	16,895
157	3:36 PM	4,664	15,980	1125.50	1127.25	1123.75	1124.50	-1.00	3.50	1125.700	411	585	461	659	15,980
158	3:37 PM	3,541	13,798	1124.50	1124.50	1121.50	1121.75	-2.75	3.00	1122.571	399	398	445	444	13,798
159	3:38 PM	3,152	14,019	1121.75	1123.25	1120.25	1122.75	1.00	3.00	1121.699	345	298	390	336	14,019
160	3:39 PM	2,239	9,543	1122.75	1124.50	1122.00	1122.00	-0.75	2.50	1123.195	291	288	328	328	9,543
161	3:40 PM	3,132	14,200	1122.00	1123.25	1121.25	1123.00	0.00	2.00	1122.173	264	314	301	350	14,200
162	3:41 PM	2,781	14,018	1122.00	1125.00	1121.50	1124.75	2.75	3.50	1122.843	325	276	369	308	14,018
163	3:42 PM	4,129	20,843	1124.50	1126.50	1123.25	1125.50	1.00	3.25	1125.139	384	411	438	460	20,843
164	3:43 PM	2,613	14,759	1125.75	1127.25	1125.00	1127.00	1.25	2.25	1126.343	302	362	231	401	14,759
165	3:44 PM	2,373	9,782	1127.25	1127.25	1125.50	1125.75	-1.50	1.75	1126.335	258	319	287	354	9,782
166	3:45 PM	3,477	18,902	1125.50	1128.00	1124.50	1127.75	2.25	3.50	1125.709	435	469	492	514	18,902
167	3:46 PM	3,378	16,747	1128.00	1128.00	1125.75	1126.75	-1.25	2.25	1127.037	394	332	429	384	16,747
168	3:47 PM	3,295	18,379	1126.75	1130.00	1126.50	1129.75	3.00	3.50	1128.657	410	438	445	484	18,379
169	3:48 PM	7,560	41,942	1129.75	1136.00	1129.50	1134.75	5.00	6.50	1133.156	705	861	779	948	41,942
170	3:49 PM	6,756	34,999	1134.75	1135.75	1132.25	1133.50	-1.25	3.50	1133.945	308	693	359	725	34,999
171	3:50 PM	4,380	24,016	1133.75	1134.00	1130.00	1131.00	-2.75	4.00	1131.096	478	455	531	509	24,016
172	3:51 PM	3,147	14,376	1131.25	1131.75	1129.50	1129.50	-1.75	2.25	1130.569	341	320	381	357	14,376
173	3:52 PM	3,086	12,720	1129.50	1131.50	1129.50	1131.00	1.50	2.00	1130.219	347	268	381	299	12,720
174	3:53 PM	2,489	12,039	1131.00	1133.75	1130.75	1132.00	1.00	3.00	1132.266	387	297	424	331	12,039
175	3:54 PM	3,126	12,940	1132.00	1132.75	1130.75	1131.75	-0.25	2.00	1131.791	274	360	289	390	12,940
176	3:55 PM	2,630	13,383	1132.00	1132.00	1129.75	1130.25	-1.75	2.25	1130.613	262	312	278	349	13,383
177	3:56 PM	4,949	27,735	1130.25	1130.50	1126.00	1126.25	-4.00	4.50	1127.954	467	476	501	527	27,735
178	3:57 PM	4,019	25,401	1126.00	1127.25	1125.50	1125.75	-0.25	1.75	1126.170	458	394	494	324	25,401
179	3:58 PM	2,944	17,147	1125.75	1126.50	1125.25	1126.00	0.75	1.25	1125.925	311	257	321	277	17,147
180	3:59 PM	5,580	49,829	1126.00	1126.25	1123.00	1123.00	-3.00	3.25	1125.008	495	399	529	432	49,829
181	4:00 PM	7,144	41,540	1123.50	1125.00	1122.25	1123.00	-0.50	2.75	1123.565	637	444	656	466	41,540
182	4:01 PM	4,153	25,393	1123.00	1123.50	1119.50	1121.75	-1.25	4.00	1121.074	498	427	539	462	25,393
183	4:02 PM	2,727	17,112	1122.00	1124.00	1120.25	1123.75	1.75	3.75	1121.772	356	294	381	323	17,112
184	4:03 PM	1,962	13,194	1123.75	1124.50	1122.00	1124.25	0.50	2.50	1123.326	245	257	263	280	13,194
185	4:04 PM	1,641	10,631	1124.25	1124.50	1122.50	1124.00	-0.25	2.00	1123.807	182	213	192	235	10,631
186	4:05 PM	1,174	5,859	1124.00	1124.50	1123.00	1123.00	-1.00	1.50	1123.596	181	141	185	158	5,859
187	4:06 PM	1,502	6,522	1123.00	1123.75	1122.25	1123.25	0.25	1.50	1122.888	150	168	164	184	6,522
188	4:07 PM	1,453	7,492	1123.25	1123.50	1121.50	1122.00	-1.25	2.00	1122.639	185	134	196	143	7,492
189	4:08 PM	1,245	7,770	1122.00	1122.25	1121.00	1121.50	-0.50	1.25	1121.641	168	139	178	161	7,770
190	4:09 PM	1,022	5,105	1121.75	1122.00	1121.00	1121.25	-0.50	1.00	1121.492	154	105	160	118	5,105
191	4:10 PM	1,575	9,974	1121.25	1122.00	1119.50	1120.50	-0.75	2.50	1120.303	175	185	292	199	9,974
192	4:11 PM	1,027	5,020	1120.25	1121.00	1119.75	1120.00	-0.25	1.25	1120.392	163	157	169	165	5,020
193	4:12 PM	612	3,237	1120.00	1120.75	1120.00	1120.50	0.50	0.75	1120.315	131	105	137	112	3,237
194	4:13 PM	1,414	6,391	1120.50	1121.75	1120.50	1121.75	1.25	1.25	1121.069	161	181	107	186	6,391
195	4:14 PM	1,454	12,283	1121.50	1122.75	1121.25	1122.75	1.25	1.50	1122.219	256	268	255	270	12,283

**CME E-mini SP Futures June 2010 Contract**  
**Summarized Activity By Second 2:41 PM-2:50 PM (Eastern Daylight Time)**  
**Trade Date May 6, 2010**

Row	Time [EDT]	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy Users	Sell Users	Volume Graph
1	2:41:00 PM	40	185	1113.25	1113.25	1113.00	1113.25	0.00	0.25	1113.230	13	22	13	22	185
2	2:41:01 PM	74	524	1113.25	1113.50	1113.00	1113.00	-0.25	0.50	1113.229	27	19	29	22	524
3	2:41:02 PM	26	195	1113.25	1113.50	1113.25	1113.25	0.00	0.25	1113.382	14	9	14	9	195
4	2:41:03 PM	6	29	1113.50	1113.50	1113.50	1113.50	0.00	0.00	1113.500	5	1	5	1	29
5	2:41:04 PM	15	72	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.483	11	4	11	4	72
6	2:41:05 PM	159	1,089	1113.50	1114.00	1113.50	1114.00	0.50	0.50	1113.581	21	57	26	60	1,089
7	2:41:06 PM	31	295	1113.75	1114.00	1113.75	1114.00	0.25	0.25	1113.968	17	7	17	6	295
8	2:41:07 PM	140	503	1114.00	1114.25	1113.75	1114.25	0.25	0.50	1113.996	46	43	52	45	503
9	2:41:08 PM	123	352	1114.50	1114.75	1114.25	1114.75	0.25	0.50	1114.548	43	47	45	53	352
10	2:41:09 PM	129	644	1114.75	1115.00	1114.50	1115.00	0.25	0.50	1114.903	52	48	57	51	644
11	2:41:10 PM	142	654	1115.00	1115.25	1114.75	1115.00	0.00	0.50	1115.088	34	57	39	65	654
12	2:41:11 PM	122	449	1115.25	1115.25	1115.00	1115.25	0.00	0.25	1115.223	34	47	36	55	449
13	2:41:12 PM	102	537	1115.25	1115.25	1114.75	1115.00	-0.25	0.50	1115.091	37	21	39	22	537
14	2:41:13 PM	46	175	1115.00	1115.00	1114.75	1115.00	0.00	0.25	1114.823	25	8	26	8	175
15	2:41:14 PM	153	1,099	1115.00	1115.00	1114.75	1114.75	-0.25	0.25	1114.807	38	33	40	47	1,099
16	2:41:15 PM	99	439	1114.75	1115.00	1114.50	1114.75	0.00	0.50	1114.739	25	31	27	36	439
17	2:41:16 PM	131	603	1114.75	1115.00	1114.50	1114.50	-0.25	0.50	1114.707	36	31	37	35	603
18	2:41:17 PM	45	248	1114.75	1115.00	1114.50	1115.00	0.25	0.50	1114.787	15	15	16	15	248
19	2:41:18 PM	91	803	1115.00	1115.00	1114.75	1115.00	0.00	0.25	1114.994	23	41	24	46	803
20	2:41:19 PM	75	299	1115.25	1115.50	1115.00	1115.50	0.25	0.50	1115.254	21	24	25	25	299
21	2:41:20 PM	85	515	1115.25	1115.50	1115.00	1115.25	0.00	0.50	1115.264	33	14	33	19	515
22	2:41:21 PM	90	392	1115.00	1115.50	1115.00	1115.25	0.25	0.50	1115.306	19	49	22	50	392
23	2:41:22 PM	60	267	1115.25	1115.25	1114.75	1114.75	-0.50	0.50	1114.991	28	16	32	10	267
24	2:41:23 PM	175	984	1114.75	1115.00	1114.50	1115.00	0.25	0.50	1114.858	45	51	49	57	984
25	2:41:24 PM	69	321	1115.00	1115.50	1115.00	1115.25	0.25	0.50	1115.240	9	39	10	40	321
26	2:41:25 PM	32	111	1115.25	1115.50	1115.25	1115.25	0.00	0.25	1115.430	9	20	9	22	111
27	2:41:26 PM	20	79	1115.25	1115.50	1115.25	1115.50	0.25	0.25	1115.459	12	9	12	9	79
28	2:41:27 PM	28	105	1115.25	1115.50	1115.25	1115.50	0.25	0.25	1115.452	10	15	11	15	105
29	2:41:28 PM	145	688	1115.25	1115.50	1115.25	1115.25	0.00	0.25	1115.299	36	29	38	28	688
30	2:41:29 PM	90	370	1115.50	1115.75	1115.50	1115.75	0.25	0.25	1115.567	28	40	19	45	370
31	2:41:30 PM	123	575	1115.50	1115.50	1115.00	1115.50	0.00	0.50	1115.407	39	18	39	21	575
32	2:41:31 PM	35	132	1115.50	1115.75	1115.50	1115.50	0.00	0.25	1115.572	12	17	12	17	132
33	2:41:32 PM	179	873	1115.50	1115.75	1114.75	1115.00	-0.50	1.00	1115.243	60	14	76	16	873
34	2:41:33 PM	58	308	1114.75	1115.00	1114.75	1115.00	0.25	0.25	1114.892	17	22	18	27	308
35	2:41:34 PM	66	271	1115.00	1115.25	1114.75	1115.00	0.00	0.50	1115.030	28	23	20	23	271
36	2:41:35 PM	306	1,557	1115.00	1115.00	1114.00	1114.25	-0.75	1.00	1114.466	70	20	91	23	1,557
37	2:41:36 PM	174	840	1114.25	1114.50	1113.75	1113.75	-0.50	0.75	1114.094	43	34	51	36	840
38	2:41:37 PM	124	654	1113.75	1114.25	1113.75	1114.00	0.25	0.50	1114.021	25	36	29	41	654
39	2:41:38 PM	93	714	1113.75	1114.00	1113.75	1114.00	0.25	0.25	1113.788	57	18	39	18	714
40	2:41:39 PM	65	232	1113.75	1114.00	1113.50	1113.75	0.00	0.50	1113.748	11	29	12	31	232
41	2:41:40 PM	37	208	1113.75	1114.00	1113.50	1113.50	-0.25	0.50	1113.807	20	11	21	11	208
42	2:41:41 PM	107	442	1113.75	1114.00	1113.50	1113.50	-0.25	0.50	1113.852	18	43	23	43	442
43	2:41:42 PM	89	265	1113.50	1113.75	1113.50	1113.75	0.25	0.25	1113.593	23	17	24	16	265
44	2:41:43 PM	200	1,154	1113.75	1114.25	1113.50	1114.00	0.25	0.75	1113.876	27	41	33	55	1,154
45	2:41:44 PM	151	646	1114.00	1114.50	1113.75	1114.00	0.00	0.75	1114.038	27	30	33	37	646
46	2:41:45 PM	11	81	1114.00	1114.25	1114.00	1114.25	0.25	0.25	1114.164	6	6	6	7	81
47	2:41:46 PM	52	325	1114.00	1114.50	1114.00	1114.50	0.50	0.50	1114.317	15	24	15	27	325
48	2:41:47 PM	112	1,160	1114.50	1114.50	1113.75	1114.00	-0.50	0.75	1114.221	44	15	47	20	1,160
49	2:41:48 PM	32	117	1114.00	1114.00	1113.75	1113.75	-0.25	0.25	1113.951	7	16	8	16	117
50	2:41:49 PM	59	365	1113.75	1114.00	1113.75	1113.75	0.00	0.25	1113.977	13	17	13	23	365
51	2:41:50 PM	58	438	1114.00	1114.00	1113.75	1114.00	0.00	0.25	1113.792	22	11	21	13	438
52	2:41:51 PM	90	638	1114.00	1114.00	1113.50	1113.50	-0.50	0.50	1113.641	23	19	27	20	638
53	2:41:52 PM	52	181	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.385	21	15	23	15	181
54	2:41:53 PM	235	1,710	1113.50	1114.00	1113.25	1114.00	0.50	0.75	1113.809	23	58	30	67	1,710
55	2:41:54 PM	65	319	1113.75	1113.75	1113.50	1113.50	-0.25	0.25	1113.741	21	12	21	11	319
56	2:41:55 PM	80	463	1113.50	1113.75	1113.50	1113.75	0.25	0.25	1113.545	26	14	27	17	463
57	2:41:56 PM	22	180	1113.50	1113.75	1113.50	1113.50	0.00	0.25	1113.560	18	9	19	9	180
58	2:41:57 PM	77	330	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.314	29	20	29	21	330
59	2:41:58 PM	56	247	1113.25	1113.50	1113.25	1113.25	0.00	0.25	1113.463	13	20	11	18	247
60	2:41:59 PM	343	1,828	1113.25	1114.25	1113.25	1114.00	0.75	1.00	1113.888	24	77	25	50	1,828



Row	Time (EST)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User ID#	Sell User ID#	Volume Graph
61	2:42:00 PM	37	97	1114.00	1114.25	1114.00	1114.25	0.25	0.25	1114.052	17	11	18	13	97
62	2:42:01 PM	57	320	1114.25	1114.25	1113.75	1114.00	-0.25	0.50	1113.997	31	8	30	8	320
63	2:42:02 PM	22	309	1114.00	1114.25	1114.00	1114.00	0.00	0.25	1114.014	8	11	8	11	309
64	2:42:03 PM	40	712	1114.25	1114.25	1114.00	1114.25	0.00	0.25	1114.198	19	12	21	13	712
65	2:42:04 PM	56	335	1114.00	1114.00	1113.50	1113.75	-0.25	0.50	1113.798	30	8	32	10	335
66	2:42:05 PM	5	15	1113.75	1113.75	1113.50	1113.50	-0.25	0.25	1113.700	3	4	3	4	15
67	2:42:06 PM	65	353	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.460	33	14	33	19	353
68	2:42:07 PM	53	260	1113.25	1113.50	1113.25	1113.25	0.00	0.25	1113.253	20	12	20	12	260
69	2:42:08 PM	60	221	1113.50	1113.50	1113.25	1113.50	0.00	0.25	1113.441	17	23	19	21	221
70	2:42:09 PM	65	296	1113.50	1113.75	1113.25	1113.50	0.00	0.50	1113.593	15	27	17	26	296
71	2:42:10 PM	67	466	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.430	22	14	25	16	466
72	2:42:11 PM	75	345	1113.25	1113.50	1113.25	1113.50	0.25	0.25	1113.260	23	10	23	10	345
73	2:42:12 PM	118	468	1113.50	1113.50	1113.00	1113.00	-0.50	0.50	1113.213	32	20	32	21	468
74	2:42:13 PM	282	1,813	1113.00	1113.25	1112.50	1112.50	-0.50	0.75	1112.878	67	52	78	70	1,813
75	2:42:14 PM	58	182	1112.50	1112.75	1112.50	1112.50	0.00	0.25	1112.589	9	38	9	38	182
76	2:42:15 PM	265	1,646	1112.50	1113.00	1112.50	1112.75	0.25	0.50	1112.874	28	60	40	76	1,646
77	2:42:16 PM	27	327	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.924	11	14	12	15	327
78	2:42:17 PM	47	509	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.800	19	15	19	20	509
79	2:42:18 PM	78	706	1113.00	1113.00	1112.75	1113.00	0.00	0.25	1112.899	15	26	15	30	706
80	2:42:19 PM	60	381	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.754	19	10	22	10	381
81	2:42:20 PM	55	342	1112.75	1113.00	1112.75	1113.00	0.25	0.25	1112.990	9	24	3	26	342
82	2:42:21 PM	220	1,925	1113.25	1113.75	1113.00	1113.50	0.25	0.75	1113.312	48	49	55	59	1,925
83	2:42:22 PM	119	677	1113.50	1113.50	1113.00	1113.00	-0.50	0.50	1113.116	35	13	46	16	677
84	2:42:23 PM	149	616	1113.00	1113.50	1112.75	1113.50	0.50	0.75	1113.168	26	41	29	56	616
85	2:42:24 PM	18	44	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.278	7	8	8	7	44
86	2:42:25 PM	22	97	1113.50	1113.50	1113.25	1113.25	-0.25	0.25	1113.356	6	12	8	12	97
87	2:42:26 PM	126	969	1113.25	1113.50	1113.00	1113.00	-0.25	0.50	1113.229	32	27	39	30	969
88	2:42:27 PM	36	169	1113.00	1113.00	1112.75	1113.00	0.00	0.25	1112.999	8	16	9	19	169
89	2:42:28 PM	29	224	1113.00	1113.25	1113.00	1113.00	0.00	0.25	1113.032	11	14	11	14	224
90	2:42:29 PM	8	20	1113.00	1113.25	1113.00	1113.00	0.00	0.25	1113.075	3	7	3	7	20
91	2:42:30 PM	28	114	1113.00	1113.00	1113.00	1113.00	0.00	0.00	1113.000	16	4	18	4	114
92	2:42:31 PM	18	47	1113.00	1113.00	1112.75	1113.00	0.00	0.25	1112.952	14	9	15	3	47
93	2:42:32 PM	42	137	1112.75	1113.00	1112.75	1113.00	0.25	0.25	1112.796	21	6	21	6	137
94	2:42:33 PM	47	197	1113.00	1113.00	1112.75	1112.75	-0.25	0.25	1112.924	9	24	9	22	197
95	2:42:34 PM	170	671	1112.75	1113.00	1112.50	1112.75	0.00	0.50	1112.582	34	17	72	19	671
96	2:42:35 PM	100	550	1112.50	1112.50	1112.25	1112.50	0.00	0.25	1112.420	25	31	27	35	550
97	2:42:36 PM	39	152	1112.50	1112.50	1112.25	1112.25	-0.25	0.25	1112.355	16	11	16	11	152
98	2:42:37 PM	66	317	1112.50	1112.75	1112.25	1112.50	0.00	0.50	1112.446	21	26	23	27	317
99	2:42:38 PM	45	219	1112.50	1113.00	1112.50	1112.75	0.25	0.50	1112.753	7	24	7	27	219
100	2:42:39 PM	21	209	1112.75	1113.00	1112.75	1112.75	0.00	0.25	1112.841	7	11	8	11	209
101	2:42:40 PM	24	120	1112.75	1112.75	1112.75	1112.75	0.00	0.00	1112.750	14	6	16	6	120
102	2:42:41 PM	111	606	1112.75	1112.75	1112.25	1112.50	-0.25	0.50	1112.498	36	20	42	20	606
103	2:42:42 PM	55	237	1112.50	1112.75	1112.50	1112.75	0.25	0.25	1112.714	7	24	7	19	237
104	2:42:43 PM	86	293	1112.50	1112.50	1112.25	1112.50	0.00	0.25	1112.365	12	16	37	17	293
105	2:42:44 PM	680	3,154	1112.50	1112.50	1111.00	1111.00	-1.50	1.50	1111.583	193	82	165	97	3,154
106	2:42:45 PM	289	1,123	1111.25	1111.25	1110.50	1110.75	-0.50	0.75	1110.792	69	67	81	69	1,123
107	2:42:46 PM	176	646	1110.75	1111.25	1110.50	1110.75	0.00	0.75	1110.822	25	59	29	64	646
108	2:42:47 PM	275	1,113	1110.75	1111.25	1110.25	1110.25	-0.50	1.00	1110.657	51	41	71	45	1,113
109	2:42:48 PM	608	2,764	1110.50	1110.50	1109.25	1109.50	-1.00	1.25	1109.672	127	78	146	93	2,764
110	2:42:49 PM	267	1,141	1109.50	1109.75	1109.00	1109.50	0.00	0.75	1109.304	58	55	66	59	1,141
111	2:42:50 PM	376	1,714	1109.50	1109.50	1108.50	1108.75	-0.75	1.00	1108.867	78	51	95	56	1,714
112	2:42:51 PM	106	878	1108.75	1109.00	1108.75	1109.00	0.25	0.25	1108.792	22	41	23	44	878
113	2:42:52 PM	215	970	1108.75	1109.25	1108.50	1109.00	0.25	0.75	1108.858	51	47	58	50	970
114	2:42:53 PM	85	603	1108.75	1109.25	1108.75	1109.25	0.50	0.50	1108.961	21	39	26	41	603
115	2:42:54 PM	288	1,605	1109.00	1109.50	1108.75	1109.00	0.00	0.75	1109.128	57	45	68	53	1,605
116	2:42:55 PM	170	717	1108.75	1109.00	1108.25	1108.25	-0.50	0.75	1108.705	45	36	47	35	717
117	2:42:56 PM	164	1,044	1108.50	1108.50	1107.75	1108.00	-0.50	0.75	1108.119	61	41	64	47	1,044
118	2:42:57 PM	246	960	1108.00	1108.00	1107.25	1107.25	-0.75	0.75	1107.570	71	42	86	48	960
119	2:42:58 PM	215	1,181	1107.25	1107.50	1106.75	1106.75	-0.50	0.75	1107.057	56	54	60	60	1,181
120	2:42:59 PM	156	617	1107.00	1107.25	1106.50	1107.00	0.00	0.75	1106.964	36	51	39	52	617

Row	Time (GMT)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
121	2:43:00 PM	352	1,913	1107.00	1107.25	1106.25	1106.25	-0.75	1.00	1106.766	68	47	91	61	1,913
122	2:43:01 PM	235	1,002	1106.25	1106.50	1105.75	1106.00	-0.25	0.75	1106.125	57	42	66	52	1,002
123	2:43:02 PM	202	718	1106.00	1106.00	1105.25	1105.50	-0.50	0.75	1105.593	56	40	57	45	718
124	2:43:03 PM	244	908	1105.50	1105.50	1104.75	1105.00	-0.50	0.75	1105.107	61	52	70	59	908
125	2:43:04 PM	100	352	1105.00	1105.25	1104.75	1105.00	0.00	0.50	1105.002	28	31	29	24	352
126	2:43:05 PM	87	388	1105.00	1105.25	1104.75	1104.75	-0.25	0.50	1105.012	44	18	48	20	388
127	2:43:06 PM	206	972	1104.75	1105.50	1104.50	1105.25	0.50	1.00	1105.046	38	62	43	72	972
128	2:43:07 PM	394	1,911	1105.50	1106.00	1105.25	1105.50	0.00	0.75	1105.482	83	68	99	82	1,911
129	2:43:08 PM	340	1,748	1105.75	1106.50	1105.25	1106.00	0.25	1.25	1105.935	69	58	89	74	1,748
130	2:43:09 PM	188	949	1106.25	1106.50	1106.00	1106.00	-0.25	0.50	1106.161	53	44	58	51	949
131	2:43:10 PM	243	1,590	1106.00	1106.00	1105.50	1105.75	-0.25	0.50	1105.795	72	37	81	42	1,590
132	2:43:11 PM	485	2,276	1105.50	1105.75	1104.50	1104.50	-1.00	1.25	1104.934	104	49	123	60	2,276
133	2:43:12 PM	548	2,201	1104.50	1104.50	1103.50	1103.50	-1.00	1.00	1103.915	80	71	103	80	2,201
134	2:43:13 PM	215	877	1103.50	1103.50	1102.75	1103.00	-0.50	0.75	1103.174	69	39	72	47	877
135	2:43:14 PM	137	725	1103.00	1103.50	1103.00	1103.00	0.00	0.50	1103.151	42	49	45	51	725
136	2:43:15 PM	115	306	1103.00	1103.25	1102.75	1103.25	0.25	0.50	1103.068	37	35	41	38	306
137	2:43:16 PM	127	842	1103.25	1103.50	1103.00	1103.50	0.25	0.50	1103.319	34	47	37	50	842
138	2:43:17 PM	124	929	1103.50	1103.75	1103.25	1103.75	0.25	0.50	1103.549	47	33	53	25	929
139	2:43:18 PM	252	939	1103.50	1104.00	1103.25	1103.75	0.25	0.75	1103.567	55	44	65	51	939
140	2:43:19 PM	254	1,379	1103.75	1104.00	1103.25	1103.25	-0.50	0.75	1103.494	54	39	69	48	1,379
141	2:43:20 PM	272	1,137	1103.25	1103.50	1102.75	1102.50	0.25	0.75	1103.171	53	60	63	77	1,137
142	2:43:21 PM	889	4,316	1103.50	1104.00	1101.50	1101.50	-2.00	2.50	1102.844	112	93	142	115	4,316
143	2:43:22 PM	327	1,428	1101.50	1102.75	1101.50	1102.25	0.75	1.25	1102.358	80	55	66	77	1,428
144	2:43:23 PM	177	1,137	1102.50	1103.25	1102.25	1103.00	0.50	1.00	1102.771	29	54	59	57	1,137
145	2:43:24 PM	202	1,530	1103.00	1103.25	1102.75	1103.00	0.00	0.50	1103.068	46	42	53	47	1,530
146	2:43:25 PM	83	761	1102.75	1103.00	1102.50	1102.75	0.00	0.50	1102.719	35	23	37	26	761
147	2:43:26 PM	156	1,103	1102.75	1103.50	1102.50	1103.25	0.50	1.00	1102.987	29	51	32	53	1,103
148	2:43:27 PM	61	472	1103.25	1103.25	1103.00	1103.25	0.00	0.25	1103.228	22	22	22	25	472
149	2:43:28 PM	255	1,781	1103.00	1103.75	1102.75	1103.75	0.75	1.00	1103.170	58	56	68	64	1,781
150	2:43:29 PM	264	1,728	1103.50	1103.75	1102.50	1102.75	-0.75	1.25	1103.108	65	43	76	46	1,728
151	2:43:30 PM	172	512	1102.50	1102.75	1101.50	1101.75	-0.75	1.25	1102.132	57	28	62	30	512
152	2:43:31 PM	232	737	1101.75	1102.00	1100.75	1100.75	-1.00	1.25	1101.274	82	43	91	46	737
153	2:43:32 PM	342	1,652	1101.00	1101.25	1100.50	1101.00	0.00	0.75	1100.939	67	56	80	60	1,652
154	2:43:33 PM	127	483	1100.75	1101.00	1100.50	1100.50	-0.25	0.50	1100.764	41	30	43	32	483
155	2:43:34 PM	131	788	1100.75	1101.00	1100.50	1100.50	-0.25	0.50	1100.798	44	39	43	41	788
156	2:43:35 PM	192	1,193	1100.75	1101.00	1100.25	1100.50	-0.25	0.75	1100.660	51	27	58	31	1,193
157	2:43:36 PM	156	1,086	1100.50	1100.75	1100.25	1100.75	0.25	0.50	1100.492	32	50	38	56	1,086
158	2:43:37 PM	202	913	1100.25	1100.75	1100.00	1100.50	0.25	0.75	1100.372	55	56	59	66	913
159	2:43:38 PM	152	1,181	1100.50	1100.75	1100.00	1100.50	0.00	0.75	1100.341	40	38	45	45	1,181
160	2:43:39 PM	190	882	1100.25	1100.50	1099.50	1099.50	-0.75	1.00	1099.910	82	27	92	29	882
161	2:43:40 PM	429	1,742	1099.50	1100.50	1099.00	1100.00	0.50	1.50	1099.832	64	82	77	95	1,742
162	2:43:41 PM	403	2,012	1100.25	1100.25	1099.00	1100.00	-0.25	1.25	1099.659	56	50	71	65	2,012
163	2:43:42 PM	130	718	1100.00	1100.50	1099.75	1100.00	0.00	0.75	1100.128	34	40	39	45	718
164	2:43:43 PM	609	3,573	1100.00	1100.50	1098.75	1099.75	-0.25	1.75	1099.347	93	54	112	69	3,573
165	2:43:44 PM	246	1,278	1099.75	1100.00	1098.75	1098.75	-1.00	1.25	1099.249	53	41	64	52	1,278
166	2:43:45 PM	333	1,284	1098.50	1100.00	1098.50	1099.75	1.25	1.50	1099.473	85	73	43	65	1,284
167	2:43:46 PM	194	1,135	1098.75	1100.00	1099.00	1099.25	-0.50	1.00	1099.637	45	40	53	46	1,135
168	2:43:47 PM	156	846	1099.25	1099.50	1098.25	1098.50	-0.75	1.25	1098.792	36	26	62	28	846
169	2:43:48 PM	133	707	1098.50	1098.75	1098.25	1098.75	0.25	0.50	1098.571	34	38	41	42	707
170	2:43:49 PM	189	846	1098.75	1099.00	1098.00	1098.25	-0.50	1.00	1098.369	47	43	54	46	846
171	2:43:50 PM	224	1,012	1098.25	1099.25	1098.00	1099.25	1.00	1.25	1098.693	39	57	42	64	1,012
172	2:43:51 PM	211	1,171	1099.25	1099.25	1098.25	1099.00	-0.25	1.00	1098.635	44	40	55	53	1,171
173	2:43:52 PM	214	1,397	1099.00	1099.25	1098.50	1099.25	0.25	0.75	1098.835	39	54	44	63	1,397
174	2:43:53 PM	229	1,392	1099.25	1099.50	1098.75	1099.50	0.25	0.75	1099.228	40	55	52	62	1,392
175	2:43:54 PM	53	371	1099.50	1099.50	1099.00	1099.00	-0.50	0.50	1099.162	20	14	23	15	371
176	2:43:55 PM	147	1,128	1099.25	1099.75	1099.25	1099.50	0.25	0.50	1099.447	41	43	47	52	1,128
177	2:43:56 PM	149	1,221	1099.50	1099.50	1099.00	1099.25	-0.25	0.50	1099.245	46	20	57	22	1,221
178	2:43:57 PM	189	1,105	1099.25	1099.25	1098.50	1099.25	0.00	0.75	1098.567	56	34	65	45	1,105
179	2:43:58 PM	164	954	1099.00	1099.50	1098.75	1098.75	-0.25	0.75	1099.132	46	35	49	39	954
180	2:43:59 PM	111	1,446	1099.00	1099.00	1098.50	1098.75	-0.25	0.50	1098.867	41	18	49	20	1,446

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
181	2:44:00 PM	170	1,049	1098.50	1098.50	1098.00	1098.00	-0.50	0.50	1098.256	36	29	60	37	1,049
182	2:44:01 PM	77	700	1098.25	1098.50	1098.00	1098.50	0.25	0.50	1098.240	24	38	26	37	700
183	2:44:02 PM	319	2,314	1098.50	1098.75	1097.50	1098.00	-0.50	1.25	1098.048	86	41	98	52	2,314
184	2:44:03 PM	283	1,422	1098.00	1098.00	1096.75	1097.50	-0.50	1.25	1097.484	65	52	83	53	1,422
185	2:44:04 PM	510	1,267	1096.75	1097.25	1096.50	1097.00	0.25	0.75	1096.948	53	66	61	79	1,267
186	2:44:05 PM	204	691	1097.25	1097.25	1096.75	1097.00	-0.25	0.50	1096.920	45	41	52	44	691
187	2:44:06 PM	369	1,519	1096.75	1097.50	1096.25	1097.25	0.50	1.25	1097.011	42	60	52	71	1,519
188	2:44:07 PM	180	1,036	1097.25	1097.75	1097.00	1097.50	0.25	0.75	1097.487	33	46	41	53	1,036
189	2:44:08 PM	138	936	1097.75	1098.00	1097.50	1097.75	0.00	0.50	1097.829	42	41	53	48	936
190	2:44:09 PM	59	315	1097.75	1097.75	1097.50	1097.50	-0.25	0.25	1097.643	18	27	19	27	315
191	2:44:10 PM	121	862	1097.50	1098.00	1097.25	1097.75	0.25	0.75	1097.605	99	91	99	95	862
192	2:44:11 PM	195	1,479	1097.75	1098.50	1097.75	1098.25	0.50	0.75	1098.054	44	58	50	62	1,479
193	2:44:12 PM	184	2,095	1098.00	1098.75	1098.00	1098.50	0.50	0.75	1098.364	50	66	52	64	2,095
194	2:44:13 PM	110	569	1098.75	1098.75	1098.50	1098.50	-0.25	0.25	1098.616	53	22	56	22	569
195	2:44:14 PM	160	1,822	1098.75	1098.75	1098.25	1098.75	0.00	0.50	1098.419	52	35	59	42	1,822
196	2:44:15 PM	95	912	1098.50	1098.75	1098.25	1098.50	0.00	0.50	1098.451	85	28	38	32	912
197	2:44:16 PM	57	499	1098.25	1098.50	1098.25	1098.25	0.00	0.25	1098.289	28	20	25	19	499
198	2:44:17 PM	187	768	1098.25	1098.50	1098.00	1098.50	0.25	0.50	1098.348	34	54	36	53	768
199	2:44:18 PM	156	971	1098.25	1098.50	1097.75	1098.00	-0.25	0.75	1098.004	48	31	57	33	971
200	2:44:19 PM	119	674	1098.25	1098.25	1097.50	1097.75	-0.50	0.75	1097.898	34	27	41	29	674
201	2:44:20 PM	189	983	1097.50	1098.25	1097.50	1097.75	0.25	0.75	1098.063	28	59	34	65	983
202	2:44:21 PM	74	283	1097.75	1098.00	1097.50	1097.50	-0.25	0.50	1097.858	24	18	26	15	283
203	2:44:22 PM	196	935	1097.50	1097.75	1097.25	1097.50	0.00	0.50	1097.474	52	39	57	43	935
204	2:44:23 PM	80	209	1097.50	1097.75	1097.00	1097.25	-0.25	0.75	1097.188	27	20	29	20	209
205	2:44:24 PM	119	388	1097.00	1097.25	1096.25	1096.50	-0.50	1.00	1096.671	48	32	55	33	388
206	2:44:25 PM	98	406	1096.50	1096.50	1096.00	1096.00	-0.50	0.50	1096.189	54	49	36	42	406
207	2:44:26 PM	181	700	1096.00	1096.25	1095.25	1095.50	-0.50	1.00	1095.696	44	55	48	57	700
208	2:44:27 PM	477	1,807	1095.50	1095.75	1093.25	1094.75	-0.75	2.50	1094.812	94	76	108	80	1,807
209	2:44:28 PM	516	1,909	1094.75	1095.75	1093.25	1094.25	-0.50	2.50	1094.848	55	63	73	77	1,909
210	2:44:29 PM	162	627	1094.25	1094.25	1093.50	1093.50	-0.75	0.75	1094.028	45	29	46	35	627
211	2:44:30 PM	449	2,681	1093.50	1095.00	1093.50	1094.75	1.25	1.50	1094.437	40	67	48	76	2,681
212	2:44:31 PM	146	1,132	1094.50	1095.00	1094.25	1094.75	0.25	0.75	1094.655	34	35	40	37	1,132
213	2:44:32 PM	203	818	1094.75	1094.75	1093.25	1093.75	-1.00	1.50	1093.823	53	26	59	32	818
214	2:44:33 PM	136	833	1093.50	1094.25	1093.50	1093.75	0.25	0.75	1093.877	32	43	34	47	833
215	2:44:34 PM	234	1,132	1093.50	1093.75	1092.50	1092.50	-1.00	1.25	1093.135	58	32	61	37	1,132
216	2:44:35 PM	349	1,040	1092.75	1093.25	1092.25	1093.25	0.50	1.00	1092.624	52	57	62	59	1,040
217	2:44:36 PM	314	1,368	1093.00	1093.25	1091.50	1091.50	-1.50	1.75	1092.449	64	50	74	53	1,368
218	2:44:37 PM	442	1,730	1091.75	1092.25	1090.50	1091.25	-0.50	1.75	1091.246	68	50	84	56	1,730
219	2:44:38 PM	176	698	1091.00	1091.25	1090.50	1091.00	0.00	0.75	1090.883	36	38	38	42	698
220	2:44:39 PM	284	1,078	1090.75	1091.25	1089.75	1091.25	0.50	1.50	1090.284	67	64	77	71	1,078
221	2:44:40 PM	271	1,896	1091.00	1091.75	1090.75	1091.00	0.00	1.00	1091.289	54	60	69	72	1,896
222	2:44:41 PM	263	1,059	1090.75	1091.25	1089.75	1089.75	-1.00	1.50	1090.576	65	51	71	61	1,059
223	2:44:42 PM	193	850	1090.00	1090.00	1088.50	1089.00	-1.00	1.50	1089.348	47	25	75	28	850
224	2:44:43 PM	320	1,197	1089.00	1089.25	1088.25	1088.75	-0.25	1.00	1088.776	44	63	47	60	1,197
225	2:44:44 PM	328	1,182	1088.50	1088.75	1086.75	1087.00	-1.50	2.00	1087.544	70	45	88	47	1,182
226	2:44:45 PM	260	891	1086.75	1088.25	1086.50	1088.00	1.25	1.75	1087.372	47	60	50	63	891
227	2:44:46 PM	354	1,815	1088.00	1088.50	1086.50	1086.50	-1.50	2.00	1087.713	63	48	72	47	1,815
228	2:44:47 PM	439	1,613	1086.50	1087.75	1086.25	1086.75	0.25	1.50	1086.996	63	49	82	69	1,613
229	2:44:48 PM	502	1,718	1086.50	1086.50	1084.75	1085.00	-1.50	1.75	1085.604	63	67	85	75	1,718
230	2:44:49 PM	325	1,158	1085.00	1086.25	1084.25	1086.00	1.00	2.00	1085.184	58	64	51	72	1,158
231	2:44:50 PM	236	1,451	1086.00	1086.25	1085.25	1085.75	-0.25	1.00	1085.644	51	53	59	59	1,451
232	2:44:51 PM	220	1,889	1085.75	1086.75	1085.75	1086.00	0.25	1.00	1086.251	43	54	53	59	1,889
233	2:44:52 PM	348	1,667	1086.00	1086.25	1084.50	1085.25	-0.75	1.75	1085.410	80	48	92	53	1,667
234	2:44:53 PM	126	549	1085.25	1085.25	1084.00	1084.50	-0.75	1.25	1084.611	40	31	44	33	549
235	2:44:54 PM	250	775	1084.25	1084.75	1083.75	1084.75	0.50	1.00	1084.251	41	47	49	52	775
236	2:44:55 PM	370	1,543	1084.50	1084.50	1082.00	1082.25	-2.25	2.50	1083.358	76	49	85	50	1,543
237	2:44:56 PM	317	921	1082.00	1082.25	1081.00	1081.50	-0.50	1.25	1081.574	48	61	60	72	921
238	2:44:57 PM	301	858	1081.50	1082.75	1081.00	1081.25	-0.25	1.75	1081.875	50	58	59	64	858
239	2:44:58 PM	197	579	1081.50	1082.00	1080.50	1081.50	0.00	1.50	1081.292	39	38	44	43	579
240	2:44:59 PM	249	1,184	1081.25	1082.50	1080.75	1082.00	0.75	1.75	1081.787	46	57	52	66	1,184

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
241	2:45:00 PM	179	1,136	1081.50	1082.00	1081.00	1081.25	-0.25	1.00	1081.537	42	38	45	42	1,136
242	2:45:01 PM	163	633	1081.00	1081.50	1080.50	1080.75	-0.25	1.00	1081.084	49	47	51	49	633
243	2:45:02 PM	168	797	1081.00	1081.25	1080.25	1081.00	0.00	1.00	1080.854	40	39	47	45	797
244	2:45:03 PM	438	1,678	1081.25	1081.25	1078.25	1078.75	-2.50	3.00	1079.915	87	51	108	59	1,678
245	2:45:04 PM	147	647	1079.00	1079.50	1078.75	1079.25	0.25	0.75	1079.194	39	45	43	51	647
246	2:45:05 PM	107	388	1079.25	1079.75	1079.00	1079.75	0.50	0.75	1079.368	30	36	32	39	388
247	2:45:06 PM	312	1,136	1079.50	1079.50	1077.75	1078.25	-1.25	1.75	1078.809	54	43	59	49	1,136
248	2:45:07 PM	215	688	1078.25	1078.50	1077.25	1077.25	-1.00	1.25	1077.902	39	40	42	45	688
249	2:45:08 PM	412	1,320	1077.50	1077.75	1076.00	1076.75	-0.75	1.75	1076.966	64	55	73	62	1,320
250	2:45:09 PM	234	659	1076.75	1077.00	1075.50	1076.75	0.00	1.50	1076.412	38	45	39	51	659
251	2:45:10 PM	390	1,396	1077.00	1077.00	1074.75	1074.75	-2.25	2.25	1076.140	50	51	59	56	1,396
252	2:45:11 PM	436	1,348	1075.25	1077.00	1074.50	1076.00	0.75	2.50	1075.844	49	66	55	75	1,348
253	2:45:12 PM	627	1,543	1076.25	1076.50	1071.75	1074.00	-2.25	4.75	1074.310	69	50	76	57	1,543
254	2:45:13 PM	387	1,400	1074.00	1075.75	1071.25	1071.75	-2.25	4.50	1074.146	58	48	65	54	1,400
255	2:45:14 PM	323	1,703	1071.75	1075.50	1071.50	1074.50	2.75	4.00	1074.399	41	51	48	60	1,703
256	2:45:15 PM	279	2,549	1075.00	1075.00	1072.75	1073.25	-1.75	2.25	1073.559	55	40	64	46	2,549
257	2:45:16 PM	235	1,186	1073.50	1074.50	1072.75	1074.25	0.75	1.75	1073.567	40	45	42	58	1,186
258	2:45:17 PM	358	2,157	1074.25	1075.25	1072.50	1072.50	-1.75	2.75	1074.149	60	50	72	57	2,157
259	2:45:18 PM	523	2,663	1072.75	1072.75	1066.50	1072.50	-0.25	6.25	1071.324	103	69	128	67	2,663
260	2:45:19 PM	273	1,223	1072.25	1072.50	1070.00	1070.75	-1.50	2.50	1071.532	51	49	58	54	1,223
261	2:45:20 PM	249	1,467	1070.75	1073.25	1070.75	1071.75	1.00	2.50	1072.383	40	62	45	68	1,467
262	2:45:21 PM	361	1,601	1071.75	1071.75	1066.75	1069.00	-2.75	5.00	1069.051	71	37	81	37	1,601
263	2:45:22 PM	337	1,692	1069.00	1071.25	1066.50	1071.25	2.25	4.75	1069.555	50	52	66	61	1,692
264	2:45:23 PM	171	831	1071.00	1071.25	1068.75	1069.25	-1.75	2.50	1069.925	42	33	47	37	831
265	2:45:24 PM	185	1,081	1068.75	1070.75	1068.75	1070.75	2.00	2.00	1069.970	33	42	34	46	1,081
266	2:45:25 PM	247	2,430	1070.50	1070.75	1068.75	1069.25	-1.25	2.00	1069.838	44	31	51	36	2,430
267	2:45:26 PM	572	3,594	1069.25	1071.00	1062.75	1064.50	-4.75	8.25	1068.156	95	62	109	75	3,594
268	2:45:27 PM	390	1,527	1064.50	1069.50	1063.00	1063.00	-1.50	6.50	1067.946	55	55	62	63	1,527
269	2:45:28 PM	133	705	1063.00	1063.00	1056.00	1056.00	-7.00	7.00	1060.909	28	13	27	13	705
270	2:45:29 PM	0	0					Stop Logic Halt							
271	2:45:30 PM	0	0					Stop Logic Halt							
272	2:45:31 PM	0	0					Stop Logic Halt							
273	2:45:32 PM	0	0					Stop Logic Halt							
274	2:45:33 PM	688	2,990	1056.75	1061.00	1056.50	1061.00	4.25	4.50	1057.120	110	94	123	104	2,990
275	2:45:34 PM	201	1,637	1060.50	1064.75	1060.25	1064.75	4.25	4.50	1063.772	38	33	44	39	1,637
276	2:45:35 PM	305	2,488	1064.50	1064.75	1060.75	1061.50	-3.00	4.00	1063.174	65	34	73	39	2,488
277	2:45:36 PM	183	930	1061.50	1062.75	1059.75	1062.75	1.25	3.00	1061.439	51	37	56	40	930
278	2:45:37 PM	186	1,342	1062.75	1066.75	1062.75	1065.00	2.25	4.00	1064.701	33	44	39	53	1,342
279	2:45:38 PM	80	430	1065.00	1066.00	1064.50	1065.00	0.00	1.50	1065.455	31	21	33	33	430
280	2:45:39 PM	299	2,521	1065.00	1066.00	1058.50	1058.75	-6.25	7.50	1062.613	81	31	90	37	2,521
281	2:45:40 PM	267	2,242	1058.75	1065.75	1058.25	1059.50	0.75	7.50	1062.432	46	45	50	52	2,242
282	2:45:41 PM	159	1,225	1062.25	1062.75	1057.50	1058.50	-3.75	5.25	1060.095	51	38	57	41	1,225
283	2:45:42 PM	263	1,605	1059.00	1066.75	1057.50	1059.25	0.25	9.25	1061.802	41	68	48	65	1,605
284	2:45:43 PM	106	711	1056.50	1061.25	1057.25	1061.00	2.50	4.00	1058.831	41	30	46	29	711
285	2:45:44 PM	160	1,077	1061.00	1062.50	1058.00	1061.25	0.25	4.50	1060.375	38	42	43	48	1,077
286	2:45:45 PM	146	1,109	1062.50	1062.50	1058.25	1059.00	-3.50	4.25	1060.047	51	26	61	33	1,109
287	2:45:46 PM	157	1,145	1061.25	1062.25	1058.50	1062.00	0.75	3.75	1060.145	43	49	49	54	1,145
288	2:45:47 PM	203	1,237	1061.75	1063.50	1059.75	1062.25	0.50	3.75	1061.904	37	37	44	48	1,237
289	2:45:48 PM	154	938	1062.25	1063.25	1062.00	1062.50	0.25	1.25	1062.393	37	23	40	39	938
290	2:45:49 PM	133	571	1062.50	1064.25	1062.25	1064.25	1.75	2.00	1063.649	28	38	32	40	571
291	2:45:50 PM	126	532	1064.25	1065.25	1063.50	1065.25	1.00	1.75	1064.420	35	36	40	42	532
292	2:45:51 PM	177	871	1065.25	1068.25	1065.00	1068.25	3.00	3.25	1065.790	30	53	33	54	871
293	2:45:52 PM	121	666	1065.75	1068.50	1065.25	1068.00	2.25	3.25	1067.091	34	30	37	30	666
294	2:45:53 PM	180	1,609	1067.75	1070.00	1067.00	1069.50	1.75	3.00	1068.991	42	50	45	53	1,609
295	2:45:54 PM	289	1,675	1069.75	1073.50	1069.50	1073.50	3.75	4.00	1071.237	59	65	62	69	1,675
296	2:45:55 PM	412	2,235	1073.25	1075.00	1070.25	1070.75	-2.50	4.75	1072.412	65	54	77	54	2,235
297	2:45:56 PM	168	956	1070.25	1071.25	1069.75	1069.75	-0.50	1.50	1070.486	52	31	55	36	956
298	2:45:57 PM	114	760	1069.75	1071.75	1069.50	1071.75	2.00	2.25	1070.562	36	34	39	35	760
299	2:45:58 PM	233	1,790	1071.25	1074.25	1068.50	1070.25	-1.00	5.75	1071.076	70	36	72	42	1,790
300	2:45:59 PM	284	1,942	1070.00	1072.50	1065.00	1069.00	-1.00	7.50	1068.054	73	42	78	45	1,942

Row	Time (EST)	Trades	Volume	First	High	Low	Last	Last First	High/Low	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Graph
301	2:46:00 PM	297	3,110	1068.75	1072.00	1061.00	1072.00	3.25	11.00	1064.924	76	52	80	58	3,110
302	2:46:01 PM	167	480	1071.00	1071.75	1063.25	1068.00	-5.00	8.50	1067.491	32	29	36	32	480
303	2:46:02 PM	110	856	1067.50	1069.25	1063.75	1064.50	-3.00	5.50	1066.697	32	25	32	30	856
304	2:46:03 PM	148	741	1063.75	1070.00	1063.75	1068.75	3.00	6.25	1067.304	36	33	42	34	741
305	2:46:04 PM	108	638	1066.75	1067.25	1063.75	1065.75	-1.00	3.50	1066.247	38	27	40	29	638
306	2:46:05 PM	112	339	1065.75	1067.00	1064.25	1064.25	-1.50	2.75	1065.759	31	30	33	33	339
307	2:46:06 PM	121	987	1065.75	1067.50	1063.50	1066.00	0.25	4.00	1064.643	38	24	40	29	987
308	2:46:07 PM	244	1,484	1064.50	1067.50	1062.75	1067.25	2.75	4.75	1064.520	48	40	55	46	1,484
309	2:46:08 PM	127	981	1063.75	1067.50	1063.00	1065.25	1.50	4.50	1065.028	35	31	38	35	981
310	2:46:09 PM	134	353	1065.50	1065.75	1063.00	1064.50	-1.00	2.75	1064.688	33	24	33	25	353
311	2:46:10 PM	113	482	1064.50	1064.75	1063.00	1063.50	-1.00	1.75	1063.830	39	29	41	31	482
312	2:46:11 PM	115	1,075	1063.50	1065.00	1062.25	1062.75	-0.75	2.75	1064.064	43	33	45	37	1,075
313	2:46:12 PM	137	612	1062.75	1065.50	1062.25	1065.50	2.75	3.25	1064.184	23	35	25	38	612
314	2:46:13 PM	75	269	1065.75	1065.75	1063.00	1065.75	0.00	2.75	1065.117	27	26	28	30	269
315	2:46:14 PM	106	658	1065.50	1065.75	1064.25	1064.75	-0.75	1.50	1065.089	40	26	44	28	658
316	2:46:15 PM	104	539	1065.00	1065.75	1063.50	1064.75	-0.25	2.25	1064.384	38	27	39	33	539
317	2:46:16 PM	130	1,275	1064.75	1068.25	1063.75	1065.50	0.75	4.50	1066.139	33	64	35	68	1,275
318	2:46:17 PM	125	894	1066.25	1066.75	1064.00	1065.75	-0.50	2.75	1064.945	38	31	41	34	894
319	2:46:18 PM	92	1,104	1065.75	1066.75	1065.50	1066.75	1.00	1.25	1066.047	22	27	25	31	1,104
320	2:46:19 PM	97	563	1066.75	1068.00	1066.25	1067.25	0.50	1.75	1066.886	35	25	37	28	563
321	2:46:20 PM	115	608	1067.25	1069.75	1066.50	1068.00	0.75	3.25	1067.811	29	41	31	49	608
322	2:46:21 PM	118	519	1068.00	1069.75	1067.75	1068.75	0.75	2.00	1068.663	33	24	35	27	519
323	2:46:22 PM	78	303	1069.50	1069.75	1068.75	1069.75	0.25	1.00	1069.229	22	22	24	24	303
324	2:46:23 PM	89	606	1069.75	1071.00	1069.25	1071.00	1.25	1.75	1070.003	27	40	31	42	606
325	2:46:24 PM	206	701	1071.00	1072.75	1070.00	1070.50	-0.50	2.75	1071.316	38	49	40	57	701
326	2:46:25 PM	203	1,558	1070.25	1072.75	1069.50	1072.25	2.00	3.25	1070.929	48	36	50	43	1,558
327	2:46:26 PM	127	1,835	1072.25	1072.25	1068.75	1070.25	-2.00	3.50	1069.976	43	28	48	28	1,835
328	2:46:27 PM	138	927	1070.75	1071.00	1068.25	1069.00	-1.75	2.75	1069.257	38	37	39	41	927
329	2:46:28 PM	124	873	1070.00	1072.75	1067.75	1072.25	2.25	5.00	1070.933	33	46	35	49	873
330	2:46:29 PM	104	427	1071.25	1072.25	1070.75	1071.25	0.00	1.50	1071.412	23	26	25	26	427
331	2:46:30 PM	180	1,083	1071.25	1074.75	1071.00	1074.75	3.50	3.75	1073.468	32	43	34	49	1,083
332	2:46:31 PM	118	739	1073.50	1074.75	1072.75	1073.00	-0.50	2.00	1073.595	28	31	32	31	739
333	2:46:32 PM	58	336	1073.50	1073.50	1072.75	1073.25	-0.25	0.75	1073.056	23	17	26	18	336
334	2:46:33 PM	282	1,950	1073.50	1077.75	1073.00	1074.75	1.25	4.75	1075.677	43	66	40	76	1,950
335	2:46:34 PM	127	673	1074.75	1075.75	1072.75	1073.00	-1.75	3.00	1074.145	33	23	37	27	673
336	2:46:35 PM	100	1,086	1073.00	1074.75	1072.75	1074.00	1.00	2.00	1074.185	29	31	33	36	1,086
337	2:46:36 PM	76	1,448	1073.75	1074.00	1072.50	1072.75	-1.00	1.50	1073.508	40	19	42	22	1,448
338	2:46:37 PM	88	926	1072.75	1073.00	1072.25	1072.50	-0.25	0.75	1072.617	26	32	26	38	926
339	2:46:38 PM	184	1,038	1072.50	1073.00	1071.00	1071.50	-1.00	2.00	1071.864	38	31	41	32	1,038
340	2:46:39 PM	320	665	1072.00	1072.50	1071.00	1072.25	0.25	1.50	1071.604	25	43	28	43	665
341	2:46:40 PM	288	1,786	1071.50	1073.75	1071.00	1071.50	0.00	2.75	1072.478	28	42	32	51	1,786
342	2:46:41 PM	142	1,271	1072.00	1073.75	1071.25	1072.75	0.75	2.50	1072.059	27	33	33	37	1,271
343	2:46:42 PM	70	424	1072.75	1073.75	1072.25	1073.25	0.50	1.50	1073.153	19	27	19	31	424
344	2:46:43 PM	72	466	1073.50	1073.75	1073.25	1073.50	0.00	0.50	1073.351	22	24	23	28	466
345	2:46:44 PM	125	958	1073.50	1074.25	1073.25	1074.00	0.50	1.00	1073.653	28	31	31	36	958
346	2:46:45 PM	57	590	1074.00	1074.50	1073.75	1074.50	0.50	0.75	1074.123	16	28	22	27	590
347	2:46:46 PM	76	683	1074.50	1074.50	1073.50	1074.00	-0.50	1.00	1073.991	26	22	30	24	683
348	2:46:47 PM	75	862	1073.75	1075.25	1073.50	1074.25	0.50	1.75	1074.077	26	34	26	40	862
349	2:46:48 PM	75	738	1074.50	1075.00	1074.00	1075.00	0.50	1.00	1074.519	27	29	29	23	738
350	2:46:49 PM	116	920	1074.50	1075.25	1073.50	1074.50	0.00	1.75	1074.220	41	24	45	28	920
351	2:46:50 PM	183	1,888	1074.25	1076.25	1074.25	1075.75	1.50	2.00	1075.027	29	41	35	49	1,888
352	2:46:51 PM	251	4,456	1075.50	1075.50	1069.50	1070.25	-5.25	6.00	1072.623	92	32	97	37	4,456
353	2:46:52 PM	126	512	1071.00	1072.50	1069.75	1071.50	0.50	2.75	1070.887	25	20	27	23	512
354	2:46:53 PM	72	368	1070.75	1071.00	1070.00	1070.50	-0.25	1.00	1070.584	20	24	22	27	368
355	2:46:54 PM	137	867	1070.00	1072.75	1069.50	1069.75	-0.25	3.25	1071.144	25	35	26	42	867
356	2:46:55 PM	162	854	1069.75	1071.75	1069.50	1071.75	2.00	2.25	1070.456	33	29	36	33	854
357	2:46:56 PM	143	1,256	1071.75	1074.50	1071.50	1072.50	0.75	3.00	1072.984	26	46	30	49	1,256
358	2:46:57 PM	41	367	1073.25	1074.00	1073.00	1073.50	0.25	1.00	1073.480	13	13	13	23	367
359	2:46:58 PM	51	393	1073.25	1073.75	1072.50	1072.75	-0.50	1.25	1073.223	11	18	14	22	393
360	2:46:59 PM	41	443	1072.50	1073.00	1072.50	1072.50	0.00	0.50	1072.621	10	16	11	20	443

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last-First Range	High/Low Range	VWAP	Buy Ards	Sell Ards	Buy User ID	Sell User ID	Volume	GrpID
361	2:47:00 PM	154	1,207	1072.75	1073.50	1071.75	1072.75	0.00	1.75	1072.326	29	34	34	29	1,207	
362	2:47:01 PM	54	198	1072.75	1073.00	1071.25	1073.00	0.25	1.75	1072.188	21	19	23	22	198	
363	2:47:02 PM	46	570	1072.25	1073.00	1072.25	1072.50	0.25	0.75	1072.652	15	19	19	19	570	
364	2:47:03 PM	41	215	1072.50	1072.50	1071.75	1072.00	-0.50	0.75	1072.286	13	18	20	19	215	
365	2:47:04 PM	72	535	1072.25	1073.00	1072.00	1072.50	0.25	1.00	1072.525	16	30	19	34	535	
366	2:47:05 PM	43	267	1072.50	1072.50	1072.00	1072.50	0.00	0.50	1072.279	18	14	19	16	267	
367	2:47:06 PM	57	695	1072.50	1072.50	1072.00	1072.25	-0.25	0.50	1072.227	21	13	26	19	695	
368	2:47:07 PM	157	1,197	1072.25	1072.75	1070.75	1072.25	0.00	2.00	1071.912	41	31	43	33	1,197	
369	2:47:08 PM	57	1,073	1072.25	1072.50	1071.75	1072.50	0.25	0.75	1072.130	14	24	17	28	1,073	
370	2:47:09 PM	73	529	1072.50	1073.00	1072.25	1073.00	0.50	0.75	1072.648	13	30	18	32	529	
371	2:47:10 PM	49	537	1073.00	1073.50	1073.00	1073.50	0.50	0.50	1073.426	17	28	18	30	537	
372	2:47:11 PM	66	701	1073.50	1074.00	1073.25	1073.75	0.25	0.75	1073.529	23	26	23	28	701	
373	2:47:12 PM	57	478	1073.75	1074.00	1073.00	1073.75	0.00	1.00	1073.742	17	26	21	27	478	
374	2:47:13 PM	42	309	1073.75	1074.00	1073.25	1073.75	0.00	0.75	1073.733	19	19	20	19	309	
375	2:47:14 PM	31	304	1073.75	1074.00	1073.25	1073.75	0.00	0.75	1073.688	12	15	15	15	304	
376	2:47:15 PM	83	1,061	1073.75	1074.50	1073.00	1073.25	-0.50	1.50	1073.792	38	18	43	18	1,061	
377	2:47:16 PM	24	205	1073.25	1074.00	1073.00	1073.25	0.00	1.00	1073.682	13	13	13	13	205	
378	2:47:17 PM	47	599	1073.00	1073.75	1073.00	1073.75	0.75	0.75	1073.377	13	19	13	21	599	
379	2:47:18 PM	82	1,180	1073.50	1073.75	1072.75	1072.75	-0.75	1.00	1073.313	26	23	29	23	1,180	
380	2:47:19 PM	30	270	1073.00	1073.25	1072.50	1073.00	0.00	0.75	1072.911	19	9	21	9	270	
381	2:47:20 PM	54	303	1073.25	1073.75	1073.00	1073.50	0.25	0.75	1073.301	17	30	18	30	303	
382	2:47:21 PM	50	444	1073.50	1073.50	1073.00	1073.25	-0.25	0.50	1073.319	17	17	17	18	444	
383	2:47:22 PM	101	1,407	1073.25	1074.00	1073.00	1074.00	0.75	1.00	1073.769	23	40	25	36	1,407	
384	2:47:23 PM	76	744	1073.75	1074.00	1073.25	1074.00	0.25	0.75	1073.615	21	20	21	19	744	
385	2:47:24 PM	113	680	1073.75	1073.75	1072.50	1073.50	-0.25	1.25	1073.358	33	25	36	27	680	
386	2:47:25 PM	64	870	1073.75	1074.00	1072.50	1073.25	-0.50	1.50	1073.107	22	24	21	27	870	
387	2:47:26 PM	47	718	1073.50	1073.75	1073.25	1073.75	0.25	0.50	1073.456	14	19	18	20	718	
388	2:47:27 PM	71	722	1074.00	1074.50	1073.75	1074.25	0.25	0.75	1074.087	24	27	24	31	722	
389	2:47:28 PM	34	186	1074.50	1074.50	1074.25	1074.25	-0.25	0.25	1074.356	13	17	16	17	186	
390	2:47:29 PM	64	397	1074.50	1074.50	1073.75	1074.00	-0.50	0.75	1074.132	32	21	40	23	397	
391	2:47:30 PM	158	1,969	1074.00	1074.75	1073.00	1074.50	0.50	1.75	1073.887	40	39	40	41	1,969	
392	2:47:31 PM	137	402	1074.50	1074.75	1073.00	1073.00	-1.50	1.75	1073.905	34	17	39	19	402	
393	2:47:32 PM	84	632	1073.75	1074.00	1072.75	1074.00	0.25	1.25	1073.703	29	19	31	21	632	
394	2:47:33 PM	109	641	1074.00	1074.50	1073.50	1074.00	0.00	1.00	1073.968	28	28	34	30	641	
395	2:47:34 PM	129	788	1074.25	1074.75	1073.00	1074.50	0.25	1.75	1073.839	34	26	40	28	788	
396	2:47:35 PM	34	276	1074.00	1074.25	1073.25	1073.25	-0.75	1.00	1073.349	13	17	14	19	276	
397	2:47:36 PM	221	1,396	1073.50	1075.00	1073.00	1074.25	0.75	2.00	1074.262	33	61	39	68	1,396	
398	2:47:37 PM	56	364	1074.25	1075.00	1073.50	1075.00	0.75	1.50	1074.471	19	21	19	23	364	
399	2:47:38 PM	45	243	1074.75	1075.25	1074.50	1075.25	0.50	0.75	1075.089	20	19	22	20	243	
400	2:47:39 PM	108	422	1075.00	1075.75	1074.50	1075.75	0.75	1.25	1075.117	30	37	33	39	422	
401	2:47:40 PM	57	414	1075.50	1076.00	1075.25	1075.75	0.25	0.75	1075.506	30	23	34	25	414	
402	2:47:41 PM	77	463	1075.25	1076.00	1075.25	1075.75	0.50	0.75	1075.389	22	26	28	30	463	
403	2:47:42 PM	107	544	1075.75	1076.75	1075.50	1075.75	0.00	1.25	1076.127	26	37	29	41	544	
404	2:47:43 PM	75	337	1076.00	1077.00	1076.00	1077.00	1.00	1.00	1076.596	21	30	22	31	337	
405	2:47:44 PM	128	433	1076.75	1077.50	1076.00	1076.50	-0.25	1.50	1076.780	23	23	56	24	433	
406	2:47:45 PM	256	1,716	1076.50	1079.50	1076.25	1077.50	1.00	3.25	1077.623	50	79	54	83	1,716	
407	2:47:46 PM	105	556	1077.50	1078.50	1076.25	1077.75	0.25	2.25	1077.003	36	34	40	37	556	
408	2:47:47 PM	82	663	1077.75	1078.50	1077.50	1078.00	0.25	1.00	1078.012	26	27	32	30	663	
409	2:47:48 PM	98	592	1078.00	1079.00	1077.50	1077.50	-0.50	1.50	1078.138	36	28	39	28	592	
410	2:47:49 PM	74	316	1078.50	1078.50	1077.50	1078.25	-0.25	1.00	1078.076	33	21	35	23	316	
411	2:47:50 PM	124	795	1078.00	1078.75	1077.50	1077.75	-0.25	1.25	1077.991	40	29	51	30	795	
412	2:47:51 PM	169	1,011	1077.75	1079.50	1077.50	1079.25	1.50	2.00	1078.946	28	45	30	48	1,011	
413	2:47:52 PM	98	1,203	1079.25	1080.25	1079.00	1080.25	1.00	1.25	1079.812	37	46	39	50	1,203	
414	2:47:53 PM	130	770	1080.25	1081.25	1080.00	1081.25	1.00	1.25	1080.604	29	46	32	48	770	
415	2:47:54 PM	305	1,486	1081.25	1082.25	1080.00	1081.00	-0.25	3.25	1081.832	60	68	69	75	1,486	
416	2:47:55 PM	136	1,655	1081.00	1081.75	1078.00	1081.75	0.75	3.75	1079.775	60	44	63	47	1,655	
417	2:47:56 PM	327	2,364	1081.75	1084.75	1077.75	1084.00	2.25	7.00	1081.643	52	81	59	85	2,364	
418	2:47:57 PM	153	1,017	1084.00	1085.25	1083.25	1085.00	1.00	2.00	1084.748	37	44	44	46	1,017	
419	2:47:58 PM	234	1,743	1085.00	1088.25	1084.50	1088.25	3.25	3.75	1085.611	46	70	46	71	1,743	
420	2:47:59 PM	174	909	1086.50	1088.25	1085.00	1086.00	-0.50	3.25	1086.133	40	34	41	35	909	

Row	Time (EDT)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Accts	Sell Accts	Buy User IDs	Sell User IDs	Volume Grabs
421	2:48:00 PM	181	1,555	1085.75	1086.75	1082.00	1082.00	-3.75	4.75	1085.323	43	40	43	43	1,555
422	2:48:01 PM	366	2,584	1086.00	1090.75	1082.00	1089.50	3.50	8.75	1087.360	46	99	53	102	2,584
423	2:48:02 PM	88	643	1089.50	1090.75	1089.50	1090.25	0.75	1.25	1090.117	29	33	52	36	643
424	2:48:03 PM	95	415	1090.50	1091.75	1090.25	1091.50	1.00	1.50	1091.066	42	34	46	34	415
425	2:48:04 PM	108	811	1091.50	1092.00	1090.75	1092.00	0.50	1.25	1091.507	40	33	41	37	811
426	2:48:05 PM	177	1,091	1092.00	1094.25	1090.25	1092.50	0.50	4.00	1092.034	47	69	51	71	1,091
427	2:48:06 PM	109	641	1092.25	1094.50	1090.25	1092.00	-0.25	4.25	1092.878	44	46	48	46	641
428	2:48:07 PM	85	449	1092.25	1093.25	1090.25	1091.25	-1.00	3.00	1091.146	37	35	38	36	449
429	2:48:08 PM	84	515	1091.00	1091.75	1090.50	1091.00	0.00	1.25	1091.121	39	35	44	36	515
430	2:48:09 PM	111	1,362	1090.50	1092.00	1090.25	1090.50	0.00	1.75	1091.432	31	47	33	50	1,362
431	2:48:10 PM	110	864	1090.50	1092.25	1090.25	1090.50	0.00	2.00	1091.324	33	40	37	44	864
432	2:48:11 PM	143	1,553	1090.25	1093.25	1090.00	1090.75	0.50	3.25	1091.522	30	70	40	75	1,553
433	2:48:12 PM	85	1,095	1090.75	1093.50	1090.25	1092.00	1.25	3.25	1092.289	23	37	28	39	1,095
434	2:48:13 PM	109	1,325	1093.00	1094.00	1092.00	1093.50	0.50	2.00	1093.301	30	49	31	64	1,325
435	2:48:14 PM	153	1,556	1093.50	1095.25	1093.00	1095.00	1.50	2.25	1094.181	34	73	38	84	1,556
436	2:48:15 PM	86	884	1095.25	1095.25	1093.00	1094.50	-0.75	2.25	1094.093	35	28	43	34	884
437	2:48:16 PM	33	533	1093.25	1094.50	1093.00	1093.00	-0.25	1.50	1093.348	28	37	29	41	533
438	2:48:17 PM	173	794	1092.75	1094.50	1090.25	1091.75	-1.00	4.25	1092.369	59	56	65	61	794
439	2:48:18 PM	72	404	1091.75	1093.25	1091.00	1091.50	-0.25	2.25	1091.443	32	27	33	29	404
440	2:48:19 PM	81	529	1091.25	1093.00	1091.00	1091.75	0.50	2.00	1091.586	29	38	32	40	529
441	2:48:20 PM	102	562	1092.25	1094.00	1091.25	1092.50	0.25	2.75	1092.306	36	45	38	49	562
442	2:48:21 PM	79	384	1092.50	1092.75	1090.75	1092.00	-0.50	2.00	1092.105	22	30	23	32	384
443	2:48:22 PM	158	798	1092.25	1093.25	1091.25	1092.00	-0.25	2.00	1092.374	33	32	35	35	798
444	2:48:23 PM	100	1,137	1091.50	1092.00	1090.75	1091.25	-0.25	1.25	1091.332	26	26	21	27	1,137
445	2:48:24 PM	115	539	1091.25	1091.75	1090.50	1091.25	0.00	1.25	1091.305	31	27	36	30	539
446	2:48:25 PM	133	979	1091.75	1092.00	1090.75	1091.75	0.00	1.25	1091.466	25	44	27	51	979
447	2:48:26 PM	81	658	1092.00	1092.00	1090.50	1091.75	-0.25	1.50	1091.196	32	29	34	34	658
448	2:48:27 PM	539	2,614	1091.75	1093.75	1090.75	1091.75	0.00	3.00	1092.525	26	68	30	74	2,614
449	2:48:28 PM	94	744	1091.50	1093.75	1091.25	1093.00	1.50	2.50	1092.921	31	27	34	29	744
450	2:48:29 PM	81	485	1092.75	1093.25	1092.00	1093.00	0.25	1.25	1092.771	30	25	32	24	485
451	2:48:30 PM	134	1,722	1093.00	1094.00	1092.50	1093.50	0.50	1.50	1093.524	45	51	48	55	1,722
452	2:48:31 PM	94	413	1092.75	1093.50	1092.25	1092.75	0.00	1.25	1092.647	23	30	28	32	413
453	2:48:32 PM	213	1,303	1092.75	1094.75	1092.75	1094.00	1.25	2.00	1093.620	30	59	36	63	1,303
454	2:48:33 PM	174	861	1094.00	1095.00	1093.25	1094.00	0.00	1.75	1094.190	29	38	35	42	861
455	2:48:34 PM	229	2,060	1094.00	1097.00	1093.50	1095.25	1.25	3.50	1095.259	37	91	32	97	2,060
456	2:48:35 PM	246	1,051	1095.75	1096.75	1093.00	1094.25	-1.50	3.75	1095.086	58	33	62	41	1,051
457	2:48:36 PM	114	515	1094.75	1095.00	1092.75	1093.25	-1.50	2.25	1093.586	30	19	33	21	515
458	2:48:37 PM	128	721	1093.25	1093.75	1092.25	1093.25	0.00	1.50	1092.962	34	32	36	37	721
459	2:48:38 PM	126	1,432	1093.00	1094.25	1091.75	1091.75	-1.25	2.50	1092.906	41	35	41	37	1,432
460	2:48:39 PM	106	1,081	1091.75	1092.75	1091.25	1092.00	0.25	1.50	1091.885	36	32	40	36	1,081
461	2:48:40 PM	100	552	1092.50	1092.75	1091.25	1091.50	-1.00	1.50	1091.727	35	26	33	27	552
462	2:48:41 PM	241	1,407	1091.50	1093.25	1089.25	1089.25	-2.25	4.00	1091.496	65	44	69	48	1,407
463	2:48:42 PM	97	560	1090.75	1090.75	1089.25	1089.50	-1.25	1.50	1089.841	29	26	30	29	560
464	2:48:43 PM	110	701	1089.50	1089.75	1087.00	1087.50	-2.00	2.75	1088.796	41	34	45	38	701
465	2:48:44 PM	137	620	1087.50	1088.25	1085.25	1086.00	-1.50	3.00	1086.752	42	31	44	33	620
466	2:48:45 PM	463	789	1086.00	1087.50	1083.25	1085.00	-1.00	4.25	1084.997	58	29	61	30	789
467	2:48:46 PM	98	273	1085.00	1086.25	1083.75	1086.25	1.25	2.50	1084.992	22	31	26	31	273
468	2:48:47 PM	80	308	1086.25	1086.50	1085.25	1086.50	0.25	1.25	1085.821	32	29	38	30	308
469	2:48:48 PM	174	1,314	1086.00	1090.00	1086.00	1089.50	3.50	4.00	1088.815	20	50	20	56	1,314
470	2:48:49 PM	89	504	1089.75	1091.25	1089.50	1090.50	0.75	1.75	1090.189	27	35	29	38	504
471	2:48:50 PM	113	717	1090.75	1091.50	1089.50	1091.50	0.75	2.00	1090.793	35	39	37	39	717
472	2:48:51 PM	66	961	1091.25	1091.50	1090.50	1091.25	0.00	1.00	1090.951	20	27	23	30	961
473	2:48:52 PM	101	1,085	1091.00	1092.25	1090.00	1090.00	-1.00	2.25	1090.940	37	31	38	32	1,085
474	2:48:53 PM	62	478	1091.25	1091.25	1089.75	1090.50	-0.75	1.50	1090.365	25	20	30	21	478
475	2:48:54 PM	51	395	1090.50	1090.50	1089.50	1089.75	-0.75	1.00	1089.948	22	22	24	25	395
476	2:48:55 PM	58	576	1089.75	1090.25	1089.25	1089.25	-0.50	1.00	1089.534	28	25	29	27	576
477	2:48:56 PM	96	1,289	1089.25	1089.75	1087.75	1089.00	-0.25	2.00	1089.218	26	28	30	31	1,289
478	2:48:57 PM	36	306	1088.00	1089.75	1088.00	1089.00	1.00	1.75	1089.141	19	25	19	26	306
479	2:48:58 PM	102	1,351	1088.75	1090.50	1088.50	1090.50	1.75	2.00	1089.785	37	52	36	53	1,351
480	2:48:59 PM	47	749	1090.50	1090.50	1088.75	1090.50	0.00	1.75	1089.115	28	18	32	18	749

Row	Time (EST)	Trades	Volume	First	High	Low	Last	Last - First Range	High/Low Range	VWAP	Buy Acct	Sell Acct	Buy User ID	Sell User ID	Volume Credit
481	2:49:00 PM	97	391	1090.50	1090.75	1088.75	1090.00	-0.50	2.00	1089.750	32	25	38	26	391
482	2:49:01 PM	67	463	1089.75	1091.00	1089.00	1090.50	0.75	2.00	1090.273	22	31	23	33	463
483	2:49:02 PM	89	440	1090.50	1091.50	1089.50	1091.25	0.75	2.00	1090.619	32	32	35	32	440
484	2:49:03 PM	81	574	1091.00	1091.50	1089.00	1090.75	-0.25	2.50	1090.407	36	18	39	22	574
485	2:49:04 PM	29	179	1090.75	1090.75	1089.75	1090.00	-0.75	1.00	1090.306	15	10	16	13	179
486	2:49:05 PM	92	731	1089.75	1091.00	1089.50	1089.75	0.00	1.50	1090.053	25	31	29	34	731
487	2:49:06 PM	50	412	1090.25	1090.50	1089.75	1089.75	-0.50	0.75	1090.026	20	14	21	18	412
488	2:49:07 PM	82	718	1090.25	1091.50	1089.75	1090.50	0.25	1.75	1090.989	24	35	24	38	718
489	2:49:08 PM	123	657	1090.50	1091.25	1090.00	1091.00	0.50	1.25	1090.683	27	30	31	32	657
490	2:49:09 PM	158	985	1091.25	1091.50	1090.00	1090.75	-0.50	1.50	1091.002	36	34	37	38	985
491	2:49:10 PM	56	399	1090.50	1091.25	1090.50	1090.75	0.25	0.75	1090.882	16	19	20	22	399
492	2:49:11 PM	51	449	1090.75	1091.25	1090.50	1091.00	0.25	0.75	1090.863	22	16	23	19	449
493	2:49:12 PM	61	439	1090.75	1091.50	1090.50	1091.25	0.50	1.00	1091.016	21	21	24	22	439
494	2:49:13 PM	81	469	1091.25	1091.50	1090.75	1091.25	0.00	0.75	1091.212	23	22	26	23	469
495	2:49:14 PM	188	1,780	1091.25	1093.25	1091.25	1092.00	0.75	2.00	1092.005	32	62	33	64	1,780
496	2:49:15 PM	197	1,029	1091.75	1093.00	1089.75	1090.00	-1.75	3.25	1090.753	79	24	79	26	1,029
497	2:49:16 PM	97	1,300	1090.75	1090.75	1088.50	1089.25	-1.50	2.25	1089.624	42	18	43	18	1,300
498	2:49:17 PM	41	275	1088.75	1089.00	1088.50	1088.50	-0.25	0.50	1088.730	19	23	21	24	275
499	2:49:18 PM	47	267	1088.50	1089.50	1088.50	1089.00	0.50	1.00	1088.874	21	21	22	24	267
500	2:49:19 PM	69	967	1089.00	1090.25	1088.50	1090.25	1.25	1.75	1089.134	27	30	29	32	967
501	2:49:20 PM	37	387	1090.00	1090.25	1089.00	1089.50	-0.50	1.25	1089.830	15	22	16	22	387
502	2:49:21 PM	99	1,230	1090.00	1090.75	1089.25	1089.50	-0.50	1.50	1090.287	18	30	21	34	1,230
503	2:49:22 PM	48	265	1089.50	1090.50	1089.50	1090.25	0.75	1.00	1089.887	17	14	22	17	265
504	2:49:23 PM	71	1,046	1090.25	1090.75	1089.50	1090.50	0.25	1.25	1089.924	36	16	40	17	1,046
505	2:49:24 PM	72	876	1090.25	1090.50	1089.25	1090.25	0.00	1.25	1089.974	27	24	29	27	876
506	2:49:25 PM	51	553	1090.00	1091.00	1090.00	1091.00	1.00	1.00	1090.397	13	21	15	21	553
507	2:49:26 PM	70	487	1090.50	1091.00	1089.75	1090.00	-0.50	1.25	1090.292	23	17	27	22	487
508	2:49:27 PM	77	680	1090.00	1090.50	1089.25	1090.00	0.00	1.25	1089.871	34	20	36	23	680
509	2:49:28 PM	68	387	1089.50	1090.00	1089.00	1089.00	-0.50	1.00	1089.464	32	23	34	26	387
510	2:49:29 PM	67	622	1089.25	1089.25	1088.50	1088.75	-0.50	0.75	1088.871	36	18	37	19	622
511	2:49:30 PM	38	618	1088.75	1089.25	1088.50	1089.25	0.50	0.75	1088.789	14	12	16	13	618
512	2:49:31 PM	89	629	1089.00	1089.50	1088.50	1088.75	-0.25	1.00	1089.168	34	28	34	24	629
513	2:49:32 PM	121	674	1088.50	1089.00	1088.25	1088.25	-0.25	0.75	1088.595	36	26	43	31	674
514	2:49:33 PM	182	1,003	1088.25	1088.50	1087.00	1087.25	-1.00	1.50	1087.656	46	39	53	42	1,003
515	2:49:34 PM	145	524	1087.25	1088.50	1086.25	1086.75	-0.50	2.25	1087.198	33	30	37	37	524
516	2:49:35 PM	102	952	1086.50	1087.50	1086.00	1087.25	0.75	1.50	1086.485	34	28	37	32	952
517	2:49:36 PM	59	507	1087.50	1087.50	1085.75	1086.00	-1.50	1.75	1086.810	31	16	33	18	507
518	2:49:37 PM	78	598	1086.00	1086.50	1085.25	1085.50	-0.50	1.25	1085.777	40	15	43	16	598
519	2:49:38 PM	93	1,019	1085.25	1086.00	1084.75	1084.75	-0.50	1.25	1085.173	42	26	46	30	1,019
520	2:49:39 PM	81	529	1085.00	1085.00	1083.75	1084.50	-0.50	1.25	1084.559	30	23	33	25	529
521	2:49:40 PM	66	501	1084.50	1084.75	1083.25	1083.75	-0.75	1.50	1084.136	24	31	25	21	501
522	2:49:41 PM	59	599	1084.25	1085.00	1083.50	1085.00	0.75	1.50	1084.521	23	30	25	33	599
523	2:49:42 PM	103	1,062	1084.75	1085.75	1084.00	1085.00	0.25	1.75	1084.917	41	30	47	32	1,062
524	2:49:43 PM	74	628	1085.00	1086.50	1084.50	1085.25	0.25	2.00	1085.522	26	34	29	25	628
525	2:49:44 PM	69	362	1085.25	1085.25	1084.00	1084.25	-1.00	1.25	1084.588	34	17	36	19	362
526	2:49:45 PM	99	839	1084.75	1085.25	1083.25	1085.00	0.25	2.00	1084.473	26	29	31	30	839
527	2:49:46 PM	78	358	1084.75	1085.00	1084.00	1085.00	0.25	1.00	1084.633	22	19	25	21	358
528	2:49:47 PM	107	868	1085.00	1085.50	1084.00	1084.75	-0.25	1.50	1084.778	28	29	33	32	868
529	2:49:48 PM	62	564	1084.75	1085.50	1084.75	1085.50	0.75	0.75	1085.274	19	22	22	24	564
530	2:49:49 PM	123	993	1085.50	1086.75	1085.00	1086.25	0.75	1.75	1085.900	42	33	48	34	993
531	2:49:50 PM	86	439	1086.00	1086.50	1085.50	1085.75	-0.25	1.00	1085.897	31	29	35	20	439
532	2:49:51 PM	107	734	1085.75	1086.75	1085.50	1085.50	-0.25	1.25	1086.052	25	21	29	34	734
533	2:49:52 PM	129	658	1085.50	1086.25	1085.25	1086.00	0.50	1.00	1085.795	29	19	33	22	658
534	2:49:53 PM	96	638	1086.00	1086.25	1085.25	1086.25	0.25	1.00	1085.847	28	27	32	27	638
535	2:49:54 PM	258	1,876	1086.00	1088.75	1085.00	1088.25	2.25	3.75	1086.380	37	58	41	60	1,876
536	2:49:55 PM	167	1,144	1088.25	1088.75	1085.25	1088.00	-0.25	3.50	1087.939	33	40	35	43	1,144
537	2:49:56 PM	80	514	1088.00	1088.25	1086.75	1087.75	-0.25	1.50	1087.744	24	23	27	24	514
538	2:49:57 PM	121	1,177	1087.75	1089.25	1087.75	1088.75	1.00	1.50	1088.525	26	35	31	39	1,177
539	2:49:58 PM	59	370	1089.00	1089.50	1088.75	1089.50	0.50	0.75	1089.114	20	20	22	21	370
540	2:49:59 PM	147	1,309	1089.25	1089.50	1088.50	1088.75	-0.50	3.00	1088.258	43	29	45	29	1,309



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